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Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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88 SPACE SCIENCES (GENERAL) **N.A.**

89 ASTRONOMY **1877**
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS **1879**
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **1880**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **1881**
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **1882**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL **1882**

Note: N.A. means that no abstracts were assigned to this category for this issue.

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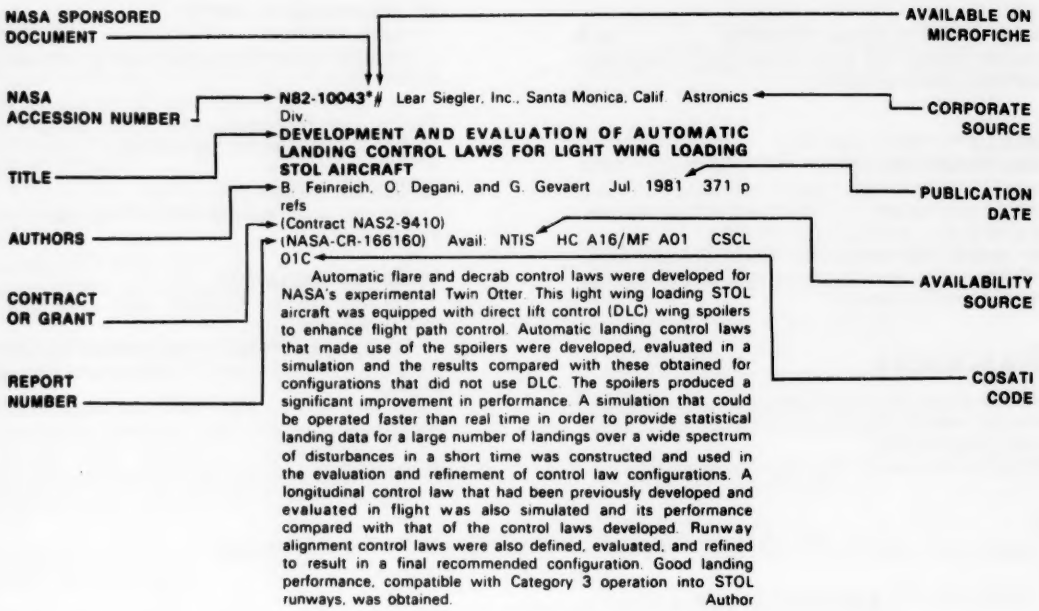
TYPICAL CITATION AND ABSTRACT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NASA ACCESSION NUMBER
N82-10043*# Lear Siegler, Inc., Santa Monica, Calif. Astronics Div.
CORPORATE SOURCE
TITLE
DEVELOPMENT AND EVALUATION OF AUTOMATIC LANDING CONTROL LAWS FOR LIGHT WING LOADING STOL AIRCRAFT
PUBLICATION DATE
AUTHORS
B. Feinreich, O. Degani, and G. Gevaert Jul. 1981 371 p refs
CONTRACT OR GRANT
(Contract NAS2-9410)
AVAILABILITY SOURCE
REPORT NUMBER
(NASA-CR-166160) Avail: NTIS HC A16/MF A01 CSCL 01C
COSATI CODE
Automatic flare and decrab control laws were developed for NASA's experimental Twin Otter. This light wing loading STOL aircraft was equipped with direct lift control (DLC) wing spoilers to enhance flight path control. Automatic landing control laws that made use of the spoilers were developed, evaluated in a simulation and the results compared with these obtained for configurations that did not use DLC. The spoilers produced a significant improvement in performance. A simulation that could be operated faster than real time in order to provide statistical landing data for a large number of landings over a wide spectrum of disturbances in a short time was constructed and used in the evaluation and refinement of control law configurations. A longitudinal control law that had been previously developed and evaluated in flight was also simulated and its performance compared with that of the control laws developed. Runway alignment control laws were also defined, evaluated, and refined to result in a final recommended configuration. Good landing performance, compatible with Category 3 operation into STOL runways, was obtained. Author

VOLUME 20 NUMBER 13/JULY 8, 1982

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N82-22141* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 146, MARCH 1982
Mar. 1982 136 p
(NASA-SP-7037(146); NAS 1.21:7037(146)) Avail: NTIS HC $5.00 CSCL 01A

This bibliography lists 442 reports, articles, and other documents introduced into the NASA scientific and technical system in February 1982. T.M.

N82-22142*# Toledo Univ., Ohio. Dept. of Chemical Engineering.
NUMERICAL SIMULATION OF ONE-DIMENSIONAL HEAT TRANSFER IN COMPOSITE BODIES WITH PHASE CHANGE M.S. Thesis, 1980 Final Report
Kenneth J. DeWitt and Gurudutt Baliga Mar. 1982 88 p refs
(Contract NAG3-72)
(NASA-CR-165607; NAS 1.26:165607) Avail: NTIS HC A05/MF A01 CSCL 20D

A numerical simulation was developed to investigate the one dimensional heat transfer occurring in a system composed of a layered aircraft blade having an ice deposit on its surface. The finite difference representation of the heat conduction equations was done using the Crank-Nicolson implicit finite difference formulation. The simulation considers uniform or time dependent heat sources, from heaters which can be either point sources or of finite thickness. For the ice water phase change, a numerical method which approximates the latent heat effect by a large heat capacity over a small temperature interval was applied. The simulation describes the temperature profiles within the various layers of the de-icer pad, as well as the movement of the ice water interface. The simulation could also be used to predict the one dimensional temperature profiles in any composite slab having different boundary conditions. M.G.

N82-22143*# Boeing Co., Seattle, Wash.
A DEVELOPMENT OF GRID GENERATION PROCEDURE FOR MULTICOMPONENT AERODYNAMIC CONFIGURATION
H. C. Chen Nov. 1981 110 p refs
(Contract NAS2-10676)
(NASA-CR-166316; NAS 1.26:166316) Avail: NTIS HC A06/MF A01 CSCL 01A

Two approaches for solving the transonic flow in a multi-block grid were explored. The first approach examines a method involving 'zonal decomposition' wherein block boundaries are treated as true boundary surfaces separating interfacing grids. The issues investigated involve techniques for matching solutions at a block boundary. A feasibility study was completed and the results are presented. The second approach involves overlapping grids for differencing across a block boundary near an artificially induced coordinate singularity occurring at a fictitious corner. This approach selects a set of neighboring nodes for the fictitious corner such that the resulting physical cells for a node are topologically the same as any other node on the airfoil surface. T.M.

N82-22144# Royal Aircraft Establishment, Farnborough (England).
THE ROYAL AIRCRAFT ESTABLISHMENT: 100 YEARS OF RESEARCH
A. J. Smith 2 Oct. 1981 33 p refs Presented at 1981 Aviation Lighting Sem., Williamsburg, Virginia, 9-13 Nov., 1981; sponsored by Illuminating Engineering Society of North America
(RAE-TM-FS-432; BR80894) Copyright. Avail: NTIS HC A03/MF A01

The work of the Royal Aircraft Establishment (RAE) from its days as His Majesty's Balloon factory to modern times is summarized. Early setbacks to aircraft production included the 1909 War Office declaration that the airplane had no military value. The First World War changed this opinion and the interwar years saw an expansion which bore fruit in the development of the gyro gun sight, stabilized bomb sight and high speed aerial reconnaissance during World War 2. The tapered ladder effect used in airfield approach lighting systems was developed after the war, along with subsonic and supersonic wind tunnels. Recent projects involving the RAE include Concorde, Earth resources satellites, and head-up displays. Author (ESA)

N82-22145# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
LA RECHERCHE AEROSPATIALE, BI-MONTHLY BULLETIN NUMBER 1981-5, SEPTEMBER - OCTOBER 1981
Claude Sevestre, ed. ESA Feb. 1982 63 p refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), No. 1981-5, Sep. - Oct. 1981 Sponsored by ESA
(ESA-TT-725) Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 45

Advances in aerospace engineering are reviewed. Flow theory and computation are considered. Signal processing algorithms are presented. Structural analysis of composite materials is discussed. Two wind tunnel investigations, helicopter rotor performance measurement and testing a digital filtering system, are also described. For individual titles, see N82-22146 through N82-22152.

N82-22146# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
REMARKS ON AXISYMMETRIC VORTEX BREAKDOWN **c02**
R. Legendre *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-5, Sep. - Oct. 1981 (ESA-TT-725) Feb. 1982 p 1-9 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), No. 1981-5, Sep. - Oct. 1981 (For primary document see N82-22145 13-01)
Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 45

Vortex breakdown is assimilated to a separation without contradicting, strictly, existing theories. A vortex breakdown scheme with the appearance of a stagnation point within the fluid similar to the stagnation point (that theoretically becomes

a stagnation circle in axisymmetric flow) which is at the origin of a breakdown at the wall is suggested. Instability is important in the appearance of turbulence. Turbulence accentuates the irreversibilities, indicating an interpretation of real irreversibility, although it is not always catastrophic. The model for very high Reynolds numbers completes that supplied by the solution of Navier-Stokes equations for low Reynolds numbers.
Author (ESA)

N82-22147# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
FINITE DIFFERENCE METHOD FOR THE INVERSE MODE COMPUTATION OF A THREE DIMENSIONAL TURBULENT BOUNDARY LAYER **c34**
M. Formery and J. Delery *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-5, Sep. - Oct. 1981 (ESA-TT-725) Feb. 1982 p 11-21 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), No. 1981-5, Sep. - Oct. 1981 (For primary document see N82-22145 13-01)
Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 45

A numerical method is proposed which solves turbulent three-dimensional boundary layer equations by an inverse approach where longitudinal and transverse displacement thicknesses are prescribed. The formulation is restricted to an incompressible boundary layer, developing on a flat plate. The equations are solved by a strongly implicit finite difference method. Applications show that a separation line can be crossed without any numerical difficulty and that it is possible to extend the calculation of the boundary layer in the reversed flow region. The flow structure in the vicinity of the separation line is faithfully represented.
Author (ESA)

N82-22148# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
ALGORITHMS FOR THE COMPUTATION OF EVEN AND ODD FOURIER-BESSEL TRANSFORMS **c64**
S. Candel *In its* La Rech. Aerospatiale, Bi-monthly Bull. No 1981-5, Sep. - Oct. 1981 (ESA-TT-725) Feb. 1982 p 23-34 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), No. 1981-5, Sep. - Oct. 1981 (For primary document see N82-22145 13-01)
Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 45

Practical applications where it is necessary to calculate the Fourier-Bessel transforms (or Hankel transforms) of a given function are considered. Two algorithms, allowing the simultaneous determination of sets of transforms with the same parity, are described. The computation involves (1) a single fast Fourier transform of size P, (2) selection of suitable Fourier components, (3) interpolation between the chosen components, and (4) calculation by fast Fourier transformation of size V of the Fourier coefficients of the sets of samples determined in the third step. Determination of L samples of the first V/2 Fourier-Bessel transforms requires some LV log V operations; this number is comparable to that of a two dimensional fast Fourier transform.
Author (ESA)

N82-22149# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
IDENTIFICATION OF MECHANICAL CHARACTERISTICS OF A STRUCTURE IN COMPOSITE MATERIAL **c24**
L. Barthe, H. Berger, J.-P. Chaquin, and R. Ohayon *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-5, Sep. - Oct. 1981 (ESA-TT-725) Feb. 1982 p 35-41 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), No. 1981-5, Sep. - Oct. 1981 (For primary document see N82-22145 13-01)
Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 45

A global identification method for complex structures was developed in order to improve a conservative finite element computation model of harmonic vibrations. This procedure was extended to the determination of elastic constants of a composite material, based on measured natural modes. These were introduced as displacements imposed on a part of the structure in a static problem, involving rigidity (through carefully chosen unknowns) and mass operators. The method consists of seeking the unknown parameters which minimize the Euclidian norm of the reaction forces, corresponding to the prescribed measured displacements. When numerous measured points are spread on the structure, it is possible to localize the modelling errors. Numerical results are presented for an axisymmetric composite structure. These results demonstrate the validity of the procedure.
Author (ESA)

N82-22150# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
BUCKLING OF COMPOSITE STRUCTURES **c39**
R. Girard *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-5, Sep. - Oct. 1981 (ESA-TT-725) Feb. 1982 p 43-54 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), No. 1981-5, Sep. - Oct. 1981 (For primary document see N82-22145 13-01)
Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 45

Buckling of composite structures is analyzed within the theoretical framework of continuous elastic media and large displacements, according to a Lagrangian formulation. A numerical solution of this nonlinear problem is achieved with a finite element discretization based on the anisotropy and heterogeneity of the constitutive materials. Problems of composite panel buckling, whose analytical solution is known, are studied in order to assess the applicability and computational efficiency of the elements. The formulation of nonlinear finite elements makes possible all the computations required for the solution of nonlinear problems by successive linearizations. These elements are three dimensional in their geometrical aspect, but they are based on shell-like hypotheses as regards displacements and mechanical behavior.
Author (ESA)

N82-22151# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
HELICOPTER ROTOR PERFORMANCE IMPROVEMENT BY UTILIZATION OF SWEPT-BACK PARABOLIC BLADE TIP **c05**
J. J. Philippe and P. Lafon *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-5, Sep. - Oct. 1981 (ESA-TT-725) Feb. 1982 p 55-56 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), No. 1981-5, Sep. - Oct. 1981 (For primary document see N82-22145 13-01)
Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 45

A sweptback parabolic tip was designed so as to improve the working conditions of an advancing blade by reducing the intensity of the shock waves which arise and the drag associated with such shocks. The design is based on the computated pressure distribution on a helicopter blade in the fundamental case of a nonlifting rotor. The results of the computations clearly show the advantages of using this geometry for a rotor blade tip. Results of tests on such tips, performed in a wind tunnel on a three bladed rotor, demonstrate an overall improvement in the performance of the rotor.
Author (ESA)

N82-22152# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
REAL TIME DIGITAL FILTERING TEST IN THE S1 CONTINUOUS WIND TUNNEL AT MODANE **c09**
J. Appel *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-5, Sep. - Oct. 1981 (ESA-TT-725) Feb. 1982 p 57-61 ref Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), No. 1981-5, Sep. - Oct. 1981 (For primary document see N82-22145 13-01)
Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 45

A set of real time digital filters was used in a wind tunnel during testing of a transport aircraft model. The performance of the digital filters, programmed at various cutoff frequencies, was compared with that of analog filters already in use. Ten measuring channels, permitting computation of three aerodynamic coefficients for the model, were recorded. The operating principle of the real time digital filters is described. Results confirm the interest of low pass filtering at a very low cutoff frequency for restoring static parameters while a model is performing an angle of attack sweep in continuous mode.
Author (ESA)

N82-22153# National Aerospace Lab., Amsterdam (Netherlands). Div. of Structures and Materials.
REVIEW OF AERONAUTICAL FATIGUE INVESTIGATIONS IN THE NETHERLANDS, MARCH 1979 - FEBRUARY 1981
J. B. deJonge Feb. 1981 43 p refs Presented at the 17th ICAF Conf., Noordwijkerhout, Netherlands, 18-19 May 1981
(NLR-MP-81006-U) Avail: NTIS HC A03/MF A01

Reports on aeronautical fatigue investigations are reviewed. The reports are cited in a subject index, covering: loads; flight simulation testing, procedures and evaluation; fatigue investigations; prediction of crack initiation and crack propagation; damage tolerance and residual strength; materials evaluation; inspection methods and service failure analysis; fatigue of aircraft materials; fatigue of laminates; fatigue of joints; and prediction of residual strength of stiffened panels. Author (ESA)

N82-22154# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
DYNAMIC ENVIRONMENTAL QUALIFICATION TECHNIQUES
Dec. 1981 245 p refs Partly in ENGLISH; one in FRENCH Proceedings of the 53rd Meeting of the Structures and Mater. Panel, Noordwijkerhout, Netherlands, 27 Sep. - 2 Oct. 1981
(AGARD-CP-318; ISBN-92-835-0306-6) Avail: NTIS HC A11/MF A01

The state of the art of dynamic qualification techniques and test methods for military aircraft with external stores are reviewed, including consideration of the rationale and interpretation of existing standards. The determination of environmental inputs from various sources and their application to specific aircraft and store configurations, including helicopters, are covered. Presentations were also given on the development of vibration analysis techniques and the evaluation of possible improvements in prediction methods and establishment of criteria. For individual titles, see N82-22155 through N82-22171.

N82-22155# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Combined Environments Test Group.
DEVELOPMENT AND USE OF DYNAMIC QUALIFICATION STANDARDS FOR AIR FORCE STORES c05
Alan H. Burkhard and Otto F. Maurer *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 7 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

The cataloging and standardization act for the standardization of items, materials, and engineering practices in the defense industry is discussed. Formal procedures for generating, updating, and utilization of these documents are presented. The advantages of standardization leading to simplification of procurement, development, and production processes by fostering uniformity, direct comparability, interchangeability of standardized objects are outlined. The state of the art of test techniques and procedures are considered. E.A.K.

N82-22156# Cape Warwick Ltd., Warwick (England). Environmental Engineering Div.
PROBLEMS IN THE GROUND SIMULATION OF DYNAMIC RESPONSES INDUCED IN EXTERNALLY CARRIED STORES DURING FLIGHT c05
J. Homfray *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 24 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

The difficulties encountered in testing stores over a wide frequency band are described. This wide frequency range has lead to vibration tests using single point excitation with an electrodynamic shaker, to cover the low frequency regime, and tests using distributed acoustic excitation to cover the middle and high frequency regimes. Both types of test are discussed and the particular difficulties encountered with large, comparatively low density thin skinned stores are emphasized. Shortcomings inherent in the current techniques are highlighted and the validity of MIL-STD-810C as a means of determining test levels in the absence of flight data is examined. It is concluded that the current two part test technique is not particularly realistic when applied to the large thin skinned stores. E.A.K.

N82-22157# Centre d'Essais Aeronautique Toulouse (France).
PROGRESS IN ELABORATING TEST PROGRAMS FOR A MECHANICAL ENVIRONMENT [PROGRESS DANS L'ELABORATION DES PROGRAMMES D'ESSAIS D'ENVIRONNEMENT MECANIQUE] c02
M. Coquelet *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 16 p refs In FRENCH (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

Whether aircraft equipment is placed in external stores or in another part of the aircraft, it is subject to ambient vibration created by flight (caused by the engine, aerodynamics, or the use of weapons). The engineer is thus faced with the problem of qualifying various equipment with regard to vibratory constraints. The procedures to be applied for qualification and the degree of severity to be adopted to cover the use of the equipment are considered. Maximum spectral densities are shown for the Airbus A300, Transvall C160, Carvelle, Alphajet, the new generation Atlantic, and the Mirage 2, Mirage F1, and Mirage 2000 aircraft. Recommendations made regarding Aero norms 612 and change proposals for MIL-STD-810 are discussed.
Transl. by A.R.H.

N82-22158# British Aerospace Aircraft Group, Preston (England). Specialist Functions, Stress Office.
QUALIFICATION OF EQUIPMENT FOR GUNFIRE INDUCED VIBRATION c05
A. Peacock *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 22 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

A method to ensure that the Tornado MK1 aircraft equipment withstand gunfire induced vibrations is described. The derivation of test spectra from rig and aircraft measurements is explained. Test failures and in-service malfunctions are reviewed. A comparison with Mil specification is made. E.A.K.

N82-22159# General Dynamics/Fort Worth, Tex.
DYNAMIC QUALIFICATION TESTING OF F-16 EQUIPMENT c05
H. E. Nevius and W. J. Brignac *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 15 p (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

Vibration prediction methods and qualification test procedures are presented for F-16 equipment. Measured vibration levels are also compared to the predictions. The most severe vibratory environment is produced by the muzzle blast pressure during gunfiring. Gunfiring vibration was measured during the YF-16 prototype program which indicated a correlation between vibration levels and distance from the gun port. Vibration data are presented verifying this relationship. Nongunfiring random vibration test levels are shown for F-16 airframe zones. The prediction procedures were based on a relationship between vibration and dynamic pressure using measured data from other aircraft. Vibration levels were measured on fuselage mounted stores. Other measured dynamic environments are presented which include wing tip missile response to store ejection from wing pylons and to jet wake encounter, and buffet response at high-angles-of-attack. Author

N82-22160# McDonnell-Douglas Corp., St. Louis, Mo. Structural Dynamics Sect.
DEVELOPMENT OF VIBRATION QUALIFICATION TEST SPECTRA FOR THE F-15 AIRCRAFT c08
G. R. Waymon *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 19 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

The vibration test spectra used for an F-15 Eagle were based on analytical predictions combined with measured data from similar aircraft. The low frequency vibration below approximately 50 Hertz results primarily from aircraft response to gusts, buffet, landing, and taxi excitation. Vibration at higher frequencies is primarily associated with acoustical excitation and gunfire. The airplane was divided into regions of comparable vibration levels. The test levels were derived using the predicted spectra and applying factors to define a performance and an endurance test. The F-15 flight measured data were used to update these predictions for the present test spectra. Author

N82-22161# British Aerospace Aircraft Group, Kingston-upon-Thames (England).
EQUIPMENT VIBRATION QUALIFICATION FOR HARRIER AND HAWK AIRCRAFT **c08**
D. C. Thorby *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 7 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

Equipment for later versions of the Harrier and all versions of the Hawk aircraft were cleared for flight vibration using test procedures based on the current British Standard. The rationale used in applying this Specification, and the flight vibration test procedures are briefly outlined from a practical viewpoint.Author

N82-22162# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
ACOUSTIC NOISE TEST AS PART OF THE DYNAMIC QUALIFICATION PROGRAM IN AEROSPACE **c71**
G. Bayerdoerfer *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 7 p (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

The mechanisms of noise generation for the purpose of acoustic qualification tests are described. Special emphasis is given to the modal density of acoustic noise fields in enclosures, such as reverberation chambers. A test program shows that for small components a sufficient modal density can be achieved in relatively small test chambers. Where applicable small chambers are favorable because of the lower test costs. Author

N82-22163# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Aircraft Div.
VIBRATION QUALIFICATION OF EXTERNAL A/C STORES AND EQUIPMENT **c08**
M. Steininger and G. Haidl *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 14 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

Prediction methods for a first assessment of vibration levels and spectra are described and application results are compared with measured vibration environment in relevant flight conditions. Signal nature and analysis technique are examined. The technique for a representative dynamic environment simulation in the laboratory especially for external store configurations is described. Different mounting and excitation methods as well as selection of shaker control reference signals are compared and discussed. Requirements for test facilities, mounting rigs and shaker capabilities are also presented. E.A.K.

N82-22164# Vereinigte Flugtechnische Werke-Fokker G.m.b.H., Bremen (West Germany). Abt. Dynamik/Aeroelastik.
AIRCRAFT FUEL TANK SLOSH AND VIBRATION TEST **c34**
Helmut Zimmermann *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 11 p (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

A dynamic qualification test for a subsonic and a supersonic external drop tank for a European fighter is presented. The test rig and the specimens are described and the measuring results are discussed. It is shown that for the supersonic tank as well as for the subsonic tank a certain slosh angle an eigenfrequency of the rig increases the amplitudes at the excitation position and the accelerations on the tank. For the subsonic tank it seems that an eigenfrequency is excited for the nose down position of the tank. The qualification requirements are examined. It is proposed that instead of using an arbitrary vibration amplitude and frequency for excitation, frequency ranges and amplitudes which are averaged out of flight measurements at the tank attachment points on the aircraft be used and that the demand for a certain input amplitude at the top of the attachment bulkheads and an output amplitude at the bottom of the attachment bulkheads be deleted. E.A.K.

N82-22165# Army Aviation Research and Development Command, St. Louis, Mo. Structures and Aeromechanics Div.
THE STRUCTURAL DYNAMIC INTERFACE REQUIRED FOR DEVELOPING HELICOPTER TARGET ACQUISITION SYSTEMS **c08**
Sam T. Crews *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 9 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

A brief description of the helicopter vibration environment is given. Two development programs were used as examples to show how vibration sensitive target acquisition systems can be interfaced to a helicopter. The systems are the Target Acquisition Data System/Pilot Night Vision System mounted to the nose of the Army's new Advanced Attack Helicopter and the Stand-Off Target Acquisition System mounted underneath the Army's BLACK HAWK helicopter. The qualification strategy and specific testing performed and to be performed are included. Author

N82-22166# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
APPROACH IN DYNAMIC QUALIFICATION OF LIGHT HELICOPTER STORES AND EQUIPMENTS **c08**
D. Braun and J. Stoppel *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 8 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

Problems occurring in connection with the dynamic qualification of equipment and external stores for light military helicopters are evaluated. Special features of the helicopter vibratory environment are discussed. Some general recommendations for the procedure of dynamic qualification for use with helicopters are given. The approach for dynamic qualification of relatively heavy equipment is presented using the example of combining the MBB BO 105 helicopter with HOT anti-tank missile launchers. To obtain a basic understanding of the dynamic behavior of the helicopter with external stores preliminary dynamic calculations were made. Shake tests were done with the separated external stores and flight test vibration measurements were obtained. Test results are presented with regard to the harmonic main rotor excitation. M.D.K.

N82-22167# Westland Helicopters Ltd., Yeovil (England). Dynamics Dept.
THE DYNAMIC QUALIFICATION OF EQUIPMENT AND EXTERNAL STORES FOR USE WITH ROTARY WINGED AIRCRAFT **c05**
G. M. Venn *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 11 p (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

The dynamic regime imposed on helicopter-borne stores and equipment, highlighting the differences between the rotary and fixed-wing environments are outlined. The need for helicopter requirements to be addressed in particular is discussed. The influence of a number of contributory factors to the dynamic environment arising from varying military applications covering both land and sea operation is also discussed. The dynamic criteria for design and testing are given, explaining the particular influence of discrete sinusoidal forcing on the helicopter environment. The evolution of these standards and their consolidation through flight and service experience is explained. Some views on the future development of dynamic qualification criteria for rotary-winged aircraft are also outlined. M.D.K.

N82-22168# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. of Aeroelasticity.
APPLICATION OF MODAL SYNTHESIS TECHNIQUES FOR THE DYNAMIC QUALIFICATION OF WINGS WITH STORES **c08**
E. Breitbach *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 22 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

Dynamic qualification as well as flutter clearance of modern combat aircraft were studied using modal coupling methods. Emphasis was placed on how to deal with special phenomena due to nonlinearities, in particular combinations of backlash and dry friction, in the connecting parts between wing, pylon and store which may significantly infringe on the validity of the linear mathematical models as used in ground and flight vibration testing. M.D.K.

N82-22169# Boeing Military Airplane Development, Seattle, Wash. Structural Dynamics Dept.
STOL AIRCRAFT STRUCTURAL VIBRATION PREDICTION FROM ACOUSTIC EXCITATION **c08**
B. F. Dotson and J. Pearson (AFWAL) *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 20 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

A method was developed to improve environment vibration prediction methods, particularly in the lower frequency range where high acoustic excitation is expected on STOL aircraft. A rigorous mathematical spectral analysis approach was used which simulated the structure with finite element models (FEM) and used measured and calculated acoustic input data for the forcing function. Calculated and measured vibrations levels were compared on a medium sized Upper Surface Blowing (USB) STOL aircraft. The development of a method for prediction of the external acoustic environment of USB flap-type STOL aircraft was also accomplished. The method compares favorably with actual measurements and represents a significant improvement in acoustic prediction methods for aircraft with USB type flaps. The method includes scaling factors for engine size, thrust, aircraft size, and other parameters. Finally, noise and vibration levels were predicted on a small STOL aircraft and later compared to measured data. Author

N82-22170# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.
GUNFIRE BLAST PRESSURE PREDICTIONS **c34**
R. M. Munt, A. J. Perry, and S. A. Moorse *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 20 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

A scheme for predicting the blast pressures from aircraft guns is presented which extends existing theory. The predictions correlate well with some experimental measurements of gun blast pressures in free space. Blast pressures were also measured experimentally on a surface in the vicinity of the muzzle of a 7.62 mm rifle but these could only be satisfactorily predicted in regions where the classical theory of regular reflection of shock waves could be applied. These results are discussed in relation to the surface blast pressures from aircraft mounted guns. Author

N82-22171# Grumman Aerospace Corp., Bethpage, N.Y.
DEVELOPMENT OF A TAPED RANDOM VIBRATION TECHNIQUE FOR ACCEPTANCE TESTING **c08**
John Devitt, Richard Pokallus, Joseph Popolo, and Eugene Baird *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 6 p (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

The use of random vibration as a screen for latent workmanship problems normally found in avionic equipment, proved to be significantly more effective than the sinusoidal form of excitation normally employed. This was demonstrated and is now required for acceptance testing by various DoD agencies. The results of a program to develop an economical technique for generating random vibration utilizing an audio tape deck indicate that compensating factors can be developed to account for the variations that exist in generically identical equipment. Using these factors, synthetic random tapes were generated. Author

N82-22172# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
MAINTENANCE IN SERVICE OF HIGH TEMPERATURE PARTS
Jan. 1982 162 p refs Meeting held at Noordwijkerhout, Netherlands, 27 Sep. - 2 Oct. 1981
(AGARD-CP-317) Avail: NTIS HC A08/MF A01

The problem areas in the inspection, repair, and life extension and prediction of gas turbine engine parts are addressed. For individual titles, see N82-22173 through N82-22186.

N82-22173# Ministry of Defence, London (England).
MILITARY MAINTENANCE POLICIES AND PROCEDURES FOR HIGH-TEMPERATURE PARTS. WILL THEY BE ADEQUATE?
R. B. G. Hedgecock *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 7 p refs (For primary document see N82-22172 13-01)
Avail: NTIS HC A08/MF A01

The problems involved in developing engine parts maintenance policies which incorporate life estimation, inspection, repair and containment of costs are examined. Computer-based engine usage monitoring systems and a low cycle atigue counter are described along with assembled and unassembled engine inspection procedures and repair techniques. M.G.

N82-22174# Dayton Univ., Ohio. Graduate Materials Engineering Program.
ENGINE DEPOT MAINTENANCE REPAIR TECHNOLOGY
James A. Snide and William J. Schulz (AFWAL) *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 19 p refs (For primary document see N82-22172 13-01)
Avail: NTIS HC A08/MF A01

The scope and mission of the two USAF engine Air Logistics Centers are described. The various processes and organizational structure to identify repair technology requirements are discussed. Approaches to transition and implementation of new technology into a repair depot environment are described. Specific examples of technology developments described are: braze repair, laser metrology, electrophoretic, coatings, sputtered MCrAlY overlay coating and inlet guide vane vibration damping. Author

N82-22175# Naval Aircraft Materials Lab., Fleetlands (England).
MAINTENANCE PROBLEMS IN GAS TURBINE COMPONENTS AT THE ROYAL NAVAL AIRCRAFT YARD, FLEETLANDS **c07**
F. J. Plumb *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 13 p refs (For primary document see N82-22172 13-01)
Avail: NTIS HC A08/MF A01

The work of the engine repair facility at Fleetlands and the major problems found in the overhaul and repair of helicopter and marine gas turbines are discussed. Remedies for component reserviceability, developments to obtain longer service lives, and the techniques employed are discussed. Author

N82-22176# KLM Royal Dutch Airlines, Amsterdam (Netherlands). Propulsion Systems Dept.
MAINTENANCE EXPERIENCE WITH CIVIL AERO ENGINES **c07**
J. Ph. Stroobach *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 3 p (For primary document see N82-22172 13-01)
Avail: NTIS HC A08/MF A01

The trends in high temperature parts maintenance concept developments are reviewed, indicating the constant activities to optimize the maintenance cost of the propulsion system. As a result of the escalating trends in material and fuel prices, the presently applied maintenance concepts require a more sophisticated condition control in order to comply with the need to find the optimum operating time of each individual engine. With the introduction of the new generation of civil aircraft (Airbus A310) a mutual goal between the engine manufacturer and the airline was defined to develop mathematical programs, based on actual recorded conditions, in order to control the behavior of the engine, aiming at an optimum use of the propulsion system. M.G.

N82-22177# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
ENGINE COMPONENT RETIREMENT FOR CAUSE **c07**
J. A. Harris, Jr., C. G. Annis, Jr., M. C. VanWanderham, and D. L. Sims *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 9 p refs (For primary document see N82-22172 13-01)
Avail: NTIS HC A08/MF A01

An engine part retirement for cause (RFC) procedure is discussed which would allow safe utilization of the full life capacity of each individual component. Since gas turbine rotor components are prime candidates and are among the most costly of engine components, adoption of a RFC maintenance philosophy could result in substantial engine systems life cycle cost savings. Two major technical disciplines must be developed and integrated to realize these cost savings: fracture mechanics and nondestructive

evaluation. The methodology and development activity required to integrate these disciplines that provide a viable RFC system for use on military gas turbine engines is discussed. The potential economic benefits of its application to a current engine system are also illustrated. M.G.

N82-22178# Rolls-Royce Ltd., Derby (England). Dept. of Materials Engineering.

DEFECTS AND THEIR EFFECT ON THE BEHAVIOR OF GAS TURBINE DISCS **c07**

Robert H. Jeal *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 15 p (For primary document see N82-22172 13-01)

Avail: NTIS HC A08/MF A01

Unless the method used to life fatigue critical components like gas turbine discs allows assessment of defect presence and behavior, the risk of serious failure is dramatically increased. A method is discussed where defect behavior can be assessed as part of a total life approach to disc behavior prediction and is explained together with the effects of differing defect types. Such an approach gives realistic manufacturing standards and controls and leads directly to an 'on condition life' approach. Author

N82-22179# Elbar B.V., Lomm (Netherlands).

A TITANIUM SILICON COATING FOR GAS TURBINE BLADES **c26**

G. H. Marijnissen *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1981 8 p refs (For primary document see N82-22172 13-01)

Avail: NTIS HC A08/MF A01

High temperature corrosion in industrial and marine gas turbines is the result of the increased inlet gas temperature of the turbine, which improves the economy, and the use of cheaper fuels, which contain more impurities. In order to reduce high temperature corrosion, a Ti-Si coating was developed on the laboratory scale. With this coating on In 738, a number of corrosion tests were performed. For further development of the coating, and for a better understanding of the behavior and degradation of the coating, insight into the corrosion mechanisms is required. On the basis of the laboratory development, the Ti-Si coating was further developed to produce an industrial coating, Elcoat 360, for use on hot components in gas turbines made of different nickelbase superalloys. Furthermore, other corrosion and oxidation tests were performed, as a result of which the behavior and the degradation of the coating is now better understood. Tests with Elcoat 360 in gas turbines are still running. Author

N82-22180# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

THE INFLUENCE OF PROTECTIVE TREATMENT ON THE MECHANICAL PROPERTIES OF SUPERALLOY PARTS [INFLUENCE DES TRAITEMENTS DE PROTECTION SUR LES PROPRIETES MECANIQUES DES PIECES EN SUPERALLIAGE] **c07**

J. M. Hauser, C. Duret, and R. Pichoir *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 11 p refs In FRENCH (For primary document see N82-22172 13-01)

Avail: NTIS HC A08/MF A01

The high temperature environment of aircraft turbine engines requires the use of protective coatings for engine parts. These coatings are particularly necessary when the composition of the superalloys used and associated heat treatment are chosen in order to obtain the best mechanical properties. The durability of these components is determined not only by the mechanical properties of the protected heat resistance alloys, but equally by the resistance of the coating to oxidation and corrosion. To restore this protection can pose diverse problems and, in certain cases, constitute an additional factor in reducing fatigue life. These aspects are considered and illustrated by results obtained from aluminium coatings applied to IN 100 and IN 738LC superalloys. Factors inherent i to t elaboration of the protection are also considered. Transl. by A.R.H.

N82-22181# Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, Paris (France). Dept. Materiaux et Procedes.

TURBINE STATOR PARTS REPAIR BY DIFFUSION BRAZING **c07**

Y. Honnorat and J. Lesgourgues *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 12 p In FRENCH; ENGLISH summary (For primary document see N82-22172 13-01)

Avail: NTIS HC A08/MF A01

With very close surfaces (maximum gap of approximately 50 micrometer for superalloys), bonding areas obtained by diffusion brazing have the same properties as the parent material. This technique is successfully applied for repair of fine cracks affecting turbine vanes after operation. However, a technique was developed to eliminate those defects which exceed maximum tolerated gaps. This process, called, diffusion brazing repair (RBD), allows bonding without geometrical limits from pre-alloyed powders. While diffusion brazing produces homogeneous bonding, the chemical composition of the repaired area after RBD processing is slightly different from that of the part. But, rough part properties can be maintained in the bonding area, provided that operating parameters of the RBD cycle are adequately selected. The two techniques may have various repair applications which are considered. Author

N82-22182# Canadian Westinghouse Co., Ltd., Hamilton (Ontario).

REJUVENATION OF USED TURBINE BLADES BY HOT ISOSTATIC PRESSING AND REHEAT TREATMENT **c26**

K. L. Cheung, C. C. Leach, K. P. Willett, and A. K. Koul (National Research Council of Canada) *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 6 p refs (For primary document see N82-22172 13-01)

Avail: NTIS HC A08/MF A01

Gas turbine blades operating at high temperature and stress experience microstructural transformations which eventually lead to their replacement. The occurrence of creep beyond allowable limits is a major cause of turbine blade replacement. Microstructure and properties of many superalloys can be restored by reheat treatment. This restoration is only partially effective if internal creep voids are present. Hot isostatic pressing is a process which can be used to heal such creep voids and, in conjunction with the reheat treatment, provides a viable method for the rejuvenation of used turbine blades. Author

N82-22183# Chromalloy Div.-Oklahoma, Midwest City.

HIP PROCESSING: POTENTIALS AND APPLICATIONS **c26**

W. J. vanderVet *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 16 p refs (For primary document see N82-22172 13-01)

Avail: NTIS HC A08/MF A01

From its inception as a means of gas pressure bonding nuclear fuel assemblies, hot isostatic pressing (HIP) today finds a wide variety of uses from cermet cutting tool manufacture, to the production and rejuvenation of gas turbine hardware. The results obtained on complete engine sets of Inconel X-750, Udimet 500 and Rene' 100 turbine blades indicate that HIP processing is capable of restoring new or near new creep properties and low cycle fatigue properties to used blades. The process should be applicable to most superalloys; nevertheless, recent work emphasized the need for preproduction process parameter verification to establish optimum cycles which take into account both the metallurgical and mechanical aspects of superalloys. A.R.H.

N82-22184# National Physical Lab., Teddington (England).

REGENERATION OF THE CREEP PROPERTIES OF A CAST Ni-Cr-BASE ALLOY **c26**

H. R. Tipler *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 6 p refs (For primary document see N82-22172 13-01)

Avail: NTIS HC A08/MF A01

The effectiveness of hot isostatic pressing (hipping) as a means of removing the damage which accumulates during creep was investigated by testing specimens for times up to 85% of their rupture life (approximately 9000h or 900h) applying a hipping treatment and then continuing the creep test, under the same conditions, to failure. A comparison of the properties of material tested to rupture without interruption and material tested to rupture after hipping at some stage during secondary or tertiary creep shows that improvements of up to 55% in the rupture

life can be obtained by the use of this regenerative treatment and that the creep resistance is also restored. The practical implications of the work relate to the application of regenerative treatments to extend the life of gas turbine components removed from service during periodic overhaul. Author

N82-22185# Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).
REPAIR AND REGENERATION OF TURBINE BLADES, VANES AND DISCS **c07**
H. Huff and J. Wortmann *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 7 p refs (For primary document see N82-22172 13-01)
Avail: NTIS HC A08/MF A01

The repair of incipiently cracked turbine components is essentially limited to non-rotating parts. Repairs to rotating parts are carried out on low-stressed areas, such as seals, only. In this case, weld build-up has proved to be a suitable process. Stator vanes can be high-temperature brazed following reduction annealing. However, problems are encountered when it comes to making sure of the complete removal of oxides. A highly promising method for increasing the reliability of turbine blades that have been in service lies in their regeneration by heat treatment or HIP-processing. Results to date are so positive that the use of regenerated blades may be a reality in the near future. However, a prerequisite for the use of these repair procedures is a guarantee of reliability and a knowledge of the stresses that occur during operation. A.R.H.

N82-22186# Elbar B.V., Lomm (Netherlands).
A NEW APPROACH TO THE WELDABILITY OF NICKEL-BASE, AS-CAST AND POWDER METALLURGY SUPERALLOYS **c26**
M. H. Haafkens and J. H. G. Matthey *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 13 p refs (For primary document see N82-22172 13-01)
Avail: NTIS HC A08/MF A01

Crack formation in the HAZ associated with the welding of high gamma' content nickelbase superalloys is due mainly to the shrinkage, which takes place during precipitation of the gamma'. Crack formation can be prevented by controlling the cooling rate during welding of these alloys. On the basis of measurements, which illustrate the relationships between a given cooling rate after welding, the partial effects of the elements Co, Cr, Al and Ti on the weldability were calculated, and this allowed a modified weldability diagram for nickelbase superalloys to be established. Simple hardness measurements appear to give really useful results for crack-free TIG welding, plasma welding, friction welding and EB welding of nickelbase superalloys. Small differences in chemical composition and the degree of homogeneity of the gamma-gamma structure can have a decisive effect on the welding behavior of superalloys. Author

N82-22187# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
COMBAT AIRCRAFT MANOEUVRABILITY
Dec. 1981 242 p refs In ENGLISH and FRENCH Proceedings of the Flight Mechanics Panel Symp., Florence, 5-8 Oct. 1981 (AGARD-CP-319; ISBN-92-835-0304-X) Avail: NTIS HC A11/MF A01

The symposium reviewed the operational requirements for combat aircraft maneuverability, technical prospects for maneuverability improvements, and prediction and assessment methods and their value. For individual titles, see N82-22188 through N82-22205.

N82-22188# Service Techniques des Programmes Aeronautiques, Paris (France). Section Etudes Generalles.
A REVIEW OF RECENT AGARD SYMPOSIA ON THE ANGLE OF MANEUVERABILITY OF COMBAT AIRCRAFT [RETROSPECTIVE DE RECENTS SYMPOSIUMS AGARD SOUS L'ANGLE DE LA MANOEUVRABILITE DES AVIONS DE COMBAT] **c05**
Jean-Michel Duc (Service des Recherches/Groupe 6) and Michel Vergne *In* AGARD Combat Aircraft Maneuverability Dec. 1981 50 p refs In FRENCH (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

The notion of maneuverability, in terms of flight mechanics, as it was treated at meetings of the Fluid Dynamics and Fluid Mechanics Panels during the past ten years is reviewed. Each point discussed is illustrated by graphics taken from previously cited AGARD proceedings. Operational needs, hopes for improvement, methods for prediction, and methods for evaluation of flight qualities at high incidence are examined. A.R.H.

N82-22189# Royal Netherlands Air Force, Soesterberg.
REVIEW OF PRACTICAL EXPERIENCE ON COMBAT AIRCRAFT MANEUVERABILITY **c05**
A. W. Henni *In* AGARD Combat Aircraft Maneuverability Dec. 1981 8 p (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

Based upon practical experience in both air to air and air to ground operations with F-84F, F-104G, and NF-5 fighter aircraft, an assessment is given of the importance of combat aircraft maneuverability. In air to ground operations the effect of limited maneuverability on tactics is treated in terms of speed/altitude and maneuverability requirements during ingress/egress and weapon delivery, in relation to attack effectiveness and survivability against enemy defenses. For air to air operations the parameters that influence the outcome of a maneuvering flight are identified. The relation between maneuverability and tactics is discussed. It is concluded that the impact of maneuveriabilty on mission effectiveness becomes less prominent at increasing total number of air to air capable aircraft, fighting in a limited airspace. Dependent on the type of operation, desirable improvements in maneuverability are discussed with emphasis on turn performance (at low speeds), rapid speed changes and direct force generation. In this context human tolerance limits are taken into account. It is stressed that the main problems confronting a fighter pilot in the Central European environment are not related to maneuverability but to the availability of military subsystems. M.G.

N82-22190# Naval Air Systems Command, Washington, D. C.
THE MILITARY FLYING QUALITIES SPECIFICATION, A HELP OR A HINDRANCE TO GOOD FIGHTER DESIGN **c05**
Ralph C. AHarrah and Robert J. Woodcock (AFWAL, Wright-Patterson AFB, Ohio) *In* AGARD Combat Aircraft Maneuverability Dec. 1981 13 p refs (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

Based on experience with Air Force and Naval aircraft, the current qualities specification is evaluated for application to a future fighter design. Analog and digital fly by wire flight control system having multiple redundancy levels and significant control law variation are discussed. Some specific observations are shared on the following topics with regard to the flying qualities in general and the specification in particular time delays, force commands, forward loop integration, high gains, signal blending, equivalent systems, pilot location, high angle of attack, roll performance, and systems integration. In addition, some general observations are made on the use of MIL-P-8785B, and a Navy conducted survey on the effectiveness of the flying qualities specification is discussed. M.G.

N82-22191# Systems Technology, Inc., Hawthorne, Calif.
DEVELOPMENT OF A TENTATIVE FLYING QUALITIES CRITERION FOR AIRCRAFT WITH INDEPENDENT CONTROL OF SIX DEGREES OF FREEDOM: ANALYSIS AND FLIGHT TEST **c08**
Roger H. Hoh, Thomas T. Myers, and Irving L. Ashkenes *In* AGARD Combat Aircraft Maneuverability Dec. 1981 12 p refs (For primary document see N82-22187 13-01)
(Contract F33615-78-C-3616)
Avail: NTIS HC A11/MF A01

A tentative flying qualities specification for aircraft having direct force effectors that allow independent control over the horizontal and vertical degrees of freedom is presented. Since the primary problem with developing flying qualities for such aircraft is their unconventional responses as reflected in a very incomplete data base. A limited flight test of a direct force control (DFC) aircraft was performed. The requirements are based on fundamental aspects of DFC pilot/vehicle dynamics to insure universal applicability. A bandwidth hypothesis is described

which makes the fundamental assumption that the primary factor in the pilot's evaluation of a DFC mode is his ability to exert tight control to minimize errors and thereby achieve improved closed loop tracking performance. The bandwidth is a measure of the maximum frequency at which such closed loop tracking can take place without threatening stability. It follows that airplanes capable of operating at a large value of bandwidth will have superior performance. M.G.

N82-22192# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
EXPERIMENTAL FLIGHT TEST PROGRAMS FOR IMPROVING COMBAT AIRCRAFT MANEUVERABILITY BY MANEUVER FLAPS AND PYLON SPLIT FLAPS c05
D. Jacob, D. Welte, and H. Wonnenberg *In* AGARD Combat Aircraft Maneuverability Dec. 1981 11 p refs (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

Two flight test programs with the Alpha-Jet as test vehicles are described. In the first program the standard wing of the aircraft was replaced by a transonic wing with maneuver flaps. Wind tunnel and flight test results are presented which show the increase in performance and maneuverability based on the improved drag polars and buffet limits. In the second program pylon split flaps were to provide flat turn and side step maneuvers by an alternating deflection of the four left or right split flaps. A drag modulation mode is ralized by symmetrical deflection of all eight flaps. M.G.

N82-22193*# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
MULTIVARIABLE CLOSED LOOP CONTROL ANALYSIS AND SYNTHESIS FOR COMPLEX FLIGHT SYSTEMS c08
David K. Schmidt *In* AGARD Combat Aircraft Maneuverability Dec. 1981 13 p refs (For primary document see N82-22187 13-01)
(Grants NAG4-1; AF-AFOSR-0042-72)
Avail: NTIS HC A11/MF A01

A flight control system analysis and synthesis method is presented that is intended to be especially suitable for application to vehicles exhibiting complex dynamic characteristics. For such vehicles quantitative handling qualities specifications are not usually available. Howver, handling qualities objectives are specifically introduced in this method via the hypothesis of correlation between pilot ratings and the objective function of an optimal control model of the human pilot. Further, since augmentation and pilot operate in parallel, simultaneous determination of the augmentation and pilot model gains is required. Desirable augmented dynamics are obtained for a variety of complex systems and the method is experimentally verified in the case of simple pilot damper gain selection for optimum pitch tracking performance. M.G.

N82-22194# General Dynamics/Fort Worth, Tex. Engineering Div.
INTEGRATION OF AVIONICS AND ADVANCED CONTROL TECHNOLOGY c04
M. E. Waddoups and C. A. Anderson *In* AGARD Combat Aircraft Maneuverability Dec. 1981 4 p (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

Two seemingly exclusive requirements, low cost tactical fighters and night under the weather operations, are being merged by means of advanced technology. The key operational problem is forced by the extremely difficult timeline for low altitude, high speed, air to surface weapon delivery. The inherent economy of single seat operation can be developed by automation. The key technological problems are caused by the lack of volume in a small fighter. In order to achieve automation of the required tasks, flight path control and sensor interfaces must be developed. Based upon emerging hardware and software technology, flight control and avionic subsystems can be optimized and integrated to achieve capability previously unavailable to small fighters. R.J.F.

N82-22195# Royal Aircraft Establishment, Farnborough (England). Flight Systems Dept.
ENHANCED PILOTING CONTROL THROUGH COCKPIT FACILITIES AND A.C.T. c08
D. J. Walker (British Aerospace P.L.C., Brough, U.K.) and P. W. J. Fullam *In* AGARD Combat Aircraft Maneuverability Dec. 1981 6 p refs (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

Total loop control, advanced cockpits, and other aspects of advanced flight control technology are discussed. General maneuvering, force sidestick, depressed roll axis, a nonlinear pitch controller and carefree maneuvering are discussed. R.J.F.

N82-22196*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE DEVELOPMENT OF CRYOGENIC WIND TUNNELS AND THEIR APPLICATION TO MANEUVERING AIRCRAFT TECHNOLOGY c09
E. C. Polhamus and R. F. Boyden *In* AGARD Combat Aircraft Maneuverability Dec. 1981 12 p refs (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

The cryogenic wind tunnel and its potential for advancing maneuvering aircraft technology is discussed. A brief overview of the cryogenic wind tunnel concept and the capabilities and status of the Langley cryogenic facilities is given, as is a review of the considerations leading to the selection of the cryogenic concept such as capital and operating costs of the tunnel, model and balance construction implications, and test condition. Typical viscous, compressibility and aeroelastic effects encountered by maneuvering aircraft are illustrated and the unique ability of the cryogenic wind tunnels to isolate and investigate these parameters while simulating full scale conditions is discussed. The status of the Langley cryogenic wind tunnel facilities is reviewed and their operating envelopes described in relation to maneuvering aircraft research and development requirements. The status of cryogenic testing technology specifically related to aircraft maneuverability studies including force balances and buffet measurement techniques is discussed. Included are examples of research carried out in the Langley 0.3 meter transonic cryogenic wind tunnel to verify the various techniques. R.J.F.

N82-22197# Institut de Mecanique des Fluides de Lille (France).
STATE OF THE ART AND RECENT PERSPECTIVES ON THE STUDY OF THE LOSS OF CONTROL AND SPIN [ETAT DE L'ART ET PERSPECTIVES NOUVELLES RELATIVES A L'ETUDE DE LA PERTE DE CONTROLE ET DES VRILLES] c05
M. G. Vanmansart and D. R. Tristrant *In* AGARD Combat Aircraft Maneuverability Dec. 1981 18 p refs In FRENCH; ENGLISH summary (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

Some experimental and analysis methods which contribute to aircraft behavior prediction at high angles and during stall-spin are discussed. A brief review of the methods, their limitations and the expected results, is given, illustrated with a few examples. R.J.F.

N82-22198# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
APPLICATION OF THE THEORY OF BIFURCATIONS TO THE STUDY OF THE LOSS OF CONTROL IN COMBAT AIRCRAFT [APPLICATION DE LA THEORIE DS BIFURCATIONS A L'ETUDE DES PERTES DE CONTROLE SUR AVION DE COMBAT] c08
Phillipe Guicheteau *In* AGARD Combat Aircraft Maneuverability Dec. 1981 13 p refs In FRENCH (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

Aircraft motion can be described in a rigorous manner by a nonlinear differential system, depending on parameters, joining variables of state (incidence, side-slip, speed ...) and variable control (positioning of rudders) by means of equations of flight mechanics and an aerodynamic model. The proposed method consists of determining the stability limits of the system, and of predicting the evolution of that which becomes unstable. It is based on the theory of bifurcation of nonlinear differential systems. A.R.H.

N82-22199# Vought Corp., Dallas, Tex. Aerodynamics Div.
PREDICTIONS OF AERODYNAMIC CHARACTERISTICS OF HIGHLY MANEUVERABLE CONFIGURATIONS c02
W. B. Brooks and T. D. Beatty *In* AGARD Combat Aircraft Maneuverability Dec. 1981 6 p refs (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

The ability of a variety of currently available methods to predict the lateral/directional characteristics of arbitrary configurations is discussed. The programs surveyed generally had either nonlinear or arbitrary body capability, but not both. Published comparisons between the hypersonic arbitrary body program and experimental data suggested a direct extension of the commonly used Allen-Jorgenson cross flow analogy to arbitrary bodies. Though useful, this extension of the Allen-Jorgenson method did not include dynamic pressure losses on aft lifting surfaces. An examination of a nonlinear approach which computes the forces on a combined body/separated region contour and corrects these forces by an empirical momentum deficit in the separated region was begun. For axisymmetric bodies the method reduces to the standard Allen-Jorgenson cross flow approach. Two potentially major advantages over the Allen-Jorgenson method are that the method does provide a model for predicting body fin interaction and that the method is extendable to arbitrary bodies. R.J.F.

N82-22200# British Aerospace Aircraft Group, Preston (England). Aerodynamics Dept.
AEROELASTIC TAILORING FOR CONTROL AND PERFORMANCE: ARE REQUIREMENTS COMPATIBLE? c08
D. Booker *In* AGARD Combat Aircraft Maneuverability Dec. 1981 4 p refs (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

The variations of camber and twist along a wing required for optimum performance in low 'g' (cruise) and high 'g' (combat) flight are discussed. It is shown that a wing with active leading edge and trailing edge maneuverer devices scheduled with angle of attack, and structurally tailored to control aeroelastic bending and torsion, can approach optimum performance. However the torsional stiffness of such a wing may be too low for satisfactory roll control at high airspeeds in supersonic flight. Some compromise to performance is implied if torsional stiffness has to be increased to provide adequate control capability. Author

N82-22201# Northrop Corp., Hawthorne, Calif. Aircraft Div.
TAIL CONFIGURATIONS FOR HIGHLY MANEUVERABLE COMBAT AIRCRAFT c08
W. E. Fellers, W. S. Bowman, and P. T. Wooler *In* AGARD Combat Aircraft Maneuverability Dec. 1981 18 p (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

The drag due to lift, maximum lift, and stability and control characteristics of tailless, canard, and aft tail configurations of highly maneuverable combat aircraft, using both aerodynamic surfaces and vectored thrust for pitch control are evaluated. The same low aspect ratio wing planform was used on all the configurations. Control configured vehicle concepts were employed. Variable wing camber employing leading edge and trailing edge flaps was used to reduce profile drag. The center of gravity was located as far aft as allowed by the stability and control criteria, in order to reduce subsonic and supersonic trim drag. The critical pitch control criterion was found to be the providing of adequate nose down pitch acceleration in the angle of attack region near maximum lift. The aft center of gravity limits for both tailless and canard configurations without pitch thrust vectoring were required to be forward of the optimum location for minimum subsonic maneuver trim drag. The aft tail configuration was not limited in this manner. In addition it could attain a higher subsonic maximum lift. It also had a greater design flexibility since the aft center of gravity limit could be influenced by the tail area. For these reasons it was the preferred configuration. B.W.

N82-22202# Avions Marcel Dassault-Breguet Aviation, Saint-Cloud (France).
EVALUATION OF AIRCRAFT IN SIMULATED COMBAT: COMPUTER AGAINST COMPUTER OR COMPUTER AGAINST HUMAN PILOT [EVALUATION D'AVIONS EN COMBAT SIMULE CALCULATEUR CONTRE CALCULATEUR OU CALCULATEUR CONTRE PILOTE HUMAIN] c05
J. Pedotti and Y. Hignard (Centre Electronique de l'Armement) *In* AGARD Combat Aircraft Maneuverability Dec. 1981 14 p refs In FRENCH (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

A program was developed for simulating one aircraft in combat with another. The adaptive logic of aerial maneuvers (LAMA) program was validated by theoretical studies and by pilot/model tests on the CELAR simulator. The program permits either an entirely numerical model or a simulation of interactive hostility against a pilot on a simulator. Not only does the program provide a means for studying new weapons systems, it also provides a hostile performer for training pilots. A.R.H.

N82-22203# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
THE ASSESSMENT OF AIRCRAFT COMBAT EFFECTIVENESS USING A NEW COMPUTATIONAL METHOD c05
Michael Falco and Gilbert Carpenter *In* AGARD Combat Aircraft Maneuverability Dec. 1981 11 p refs Sponsored in part by Army Aviation Research and Development Command (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

A computational method for the assessment of aircraft combat effectiveness in the design concept phase is discussed. The approach employs a stochastic learning method, in conjunction with dynamic simulation, to derive aircraft maneuver strategies in the form of a feedback control based upon a discretized set of threat visual or warning system cues. The derived strategies maximize either survival probability of kill probability in the one on one setting. Computational results are presented for selected aircraft designs in missile and gun combat. B.W.

N82-22204# McDonnell-Douglas Corp., St. Louis, Mo. Operations Analysis Dept.
EVALUATION OF DIRECT FORCE MODE FIGHTERS BY COMBAT SIMULATION c08
C. H. Guthrie *In* AGARD Combat Aircraft Maneuverability Dec. 1981 13 p (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

Advanced fighter concepts which have been significantly influenced by air combat simulation are discussed. Both man in the loop and digital combat simulation are excellent tools for developing and screening advanced fighter concepts. One important application is the evaluation of fighters with high authority aerodynamic and propulsive controls. Manned and digital air combat simulations showed that high authority controls substantially increase combat effectiveness when used both for enhance large scale maneuverability and for automatic pointing of the fuselage. Digital simulation showed that fighters with high authority direct force modes require lower sustained load factors than conventional designs for a constant level of effectiveness in close in combat. Therefore, fighters with direct force modes can be lighter and less expensive than conventional aircraft. In a manned simulation of close in combat, single fighters with several levels of aerodynamic and propulsion control authority were flown against two threat fighters of equal instantaneous sustained turn rate capability and with identical avionics and armament. For the fighter configured with the highest authority controls, many measures of engagement control and effectiveness were double those of the conventional (baseline) fighter. B.W.

N82-22205# British Aerospace Aircraft Group, Preston (England).
THE STUDY OF COMBAT AIRCRAFT MANEUVERABILITY BY AIR TO AIR COMBAT SIMULATION c05
A. G. Barnes *In* AGARD Combat Aircraft Maneuverability Dec. 1981 9 p (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

Air to air combat by ground based simulation and its contribution to the design, development and operational use of combat aircraft is evaluated. The merits of different aircraft/missile combinations can be assessed under controlled conditions with pilot involvement. Parameters which influence maneuverability, such as sustained turn rate, attained turn rate, and SEP can be easily varied, and translated into combat success. The relative

importance of these parameters are discussed in the light of experimental results. B.W.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N82-22206*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.

AERODYNAMIC PERFORMANCE OF SLENDER WINGS WITH SEPARATED FLOWS Technical Report, period ending 31 Dec. 1981

C. Subba Reddy Mar. 1982 64 p refs
(Grant NsG-1561)
(NASA-CR-168768; NAS 1.26:168768) Avail: NTIS HC A04/MF A01 CSCL 01A

The aerodynamic performance of low aspect ratio sweptback wings with vortex flows was numerically investigated using the free vortex sheet method. The models studied included flat, cambered, strake, and leading edge flapped wings of different planforms. The theoretical results predicted by the method were compared with the existing experimental data wherever available; and the code capabilities and limitations were explored. Also the effects of the wing thickness, fuselage, leading edge flap and multiple vortex modeling on the aerodynamic characteristics were studied. Author

N82-22207*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

WIND-TUNNEL INVESTIGATION OF THE POWERED LOW-SPEED LONGITUDINAL AERODYNAMICS OF THE VECTORED-ENGINE-OVER (VEO) WING FIGHTER CONFIGURATION

John W. Paulson, Perry D. Whitten (General Dynamics Corp., Fort Worth, Tex.), and Stephen C. Stumpfl (AFWAL) Mar. 1982 274 p refs
(NASA-TM-83263; NAS 1.15:83263) Avail: NTIS HC A12/MF A01 CSCL 01A

A wind-tunnel investigation incorporating both static and wind-on testing was conducted in the Langley 4- by 7-Meter Tunnel to determine the effects of vectored thrust along with spanwise blowing on the low-speed aerodynamics of an advanced fighter configuration. Data were obtained over a large range of thrust coefficients corresponding to takeoff and landing thrust settings for many nozzle configurations. The complete set of static thrust data and the complete set of longitudinal aerodynamic data obtained in the investigation are presented. These data are intended for reference purposes and, therefore, are presented without analysis or comment. The analysis of the thrust-induced effects found in the investigation are not discussed. Author

N82-22208*# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.

MEAN VELOCITIES AND REYNOLDS STRESSES IN A JUNCTURE FLOW Semiannual Status Report, period ending 31 Mar. 1982

H. McMahon, J. Hubbartt, and L. Kubendran 31 Mar. 1982 11 p
(Grant NAG1-40)
(NASA-CR-168791; NAS 1.26:168791) Avail: NTIS HC A02/MF A01 CSCL 01A

Three mean velocity components and six Reynolds stresses were measured at two streamwise stations in a juncture flow using hot-wire anemometer techniques. Author

N82-22209*# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mechanical Engineering, Aeronautical Engineering and Mechanics.

INVESTIGATION OF PASSIVE SHOCK WAVE-BOUNDARY LAYER CONTROL FOR TRANSONIC AIRFOIL DRAG REDUCTION Final Report, 1 Oct. 1979 - 30 Sep. 1981

H. T. Nagamatsu, W. B. Brower, Jr., L. Bahi, and J. Ross Apr. 1982 204 p refs
(Grant NsG-1624)
(NASA-CR-168844; NAS 1.26:168844) Avail: NTIS HC A10/MF A01 CSCL 01A

The passive drag control concept, consisting of a porous surface with a cavity beneath it, was investigated with a 12-percent-thick circular arc and a 14-percent-thick supercritical airfoil mounted on the test section bottom wall. The porous surface was positioned in the shock wave/boundary layer interaction region. The flow circulating through the porous surface, from the downstream to the upstream of the terminating shock wave location, produced a lambda shock wave system and a pressure decrease in the downstream region minimizing the flow separation. The wake impact pressure data show an appreciably drag reduction with the porous surface at transonic speeds. To determine the optimum size of porosity and cavity, tunnel tests were conducted with different airfoil porosities, cavities and flow Mach numbers. A higher drag reduction was obtained by the 2.5 percent porosity and the 1/4-inch deep cavity. T.M.

N82-22210*# Universities Space Research Association, Columbia, Md.

DESIGN OF SUPERCRITICAL CASCADES WITH HIGH SOLIDITY

Jose M. Sanz Feb. 1982 8 p refs
(Contract NAS3-2253)
(NASA-CR-165600; NAS 1.26:165600) Avail: NTIS HC A02/MF A01 CSCL 01A

The method of complex characteristics of Garabedian and Korn was successfully used to design shockless cascades with solidities of up to one. A code was developed using this method and a new hodograph transformation of the flow onto an ellipse. This code allows the design of cascades with solidities of up to two and larger turning angles. The equations of potential flow are solved in a complex hodograph like domain by setting a characteristic initial value problem and integrating along suitable paths. The topology that the new mapping introduces permits a simpler construction of these paths of integration. M.G.

N82-22211*# Boeing Commercial Airplane Co., Seattle, Wash.

AERODYNAMIC ANALYSIS OF VTOL INLETS AND DEFINITION OF A SHORT, BLOWING-LIP INLET Final Report

J. Syberg and A. L. Jones Apr. 1982 61 p refs
(Contract NAS3-22369)
(NASA-CR-165617; NAS 1.26:165617; D6-51418) Avail: NTIS HC A04/MF A01 CSCL 01A

The results indicated that, without boundary layer control, either a very long inlet or an inlet with a very high contraction ratio lip will be required to meet the stringent design requirements. It is shown that active boundary layer control is an effective means of preventing separation and that a significant reduction in inlet size can be achieved by removing only a small amount of bleed in the throat region of the inlet. A short, blowing-lip model was designed and fabricated. This model features an adjustable, blowing slot located near the hilite on the windward side of the inlet. T.M.

N82-22212# National Aerospace Lab., Tokyo (Japan). Noise and Emission Research Group.

AERODYNAMIC CHARACTERISTICS OF THE EXTERNAL USB POWERED LIFT SYSTEM USING SIDE FENCES FOR ENHANCEMENT OF COANDA FLOW ATTACHMENT

Masataka Maita, Hirotoshi Fujieda, and Shigemi Shindo Oct. 1981 20 p refs
(NAL-TR-686T; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The fundamental aspects concerning the effect of side fences on powered lift augmentation for the external upper surface blowing (USB) propulsive-lift configuration, as ascertained by wind tunnel experiment, are presented. From the comparisons of aerodynamic performances made of configurations using side fences and of those using either vortex generators or using no special devices, it is concluded that the USB propulsive-lift concept using side fences for enhancement of engine exhaust flow attachment has promising potential for attaining very high and efficient powered lift performances. M.G.

N82-22213*# Bihrle Applied Research, Inc., Jericho, N. Y.
ANALYSIS OF ROTARY BALANCE DATA FOR THE F-15 AIRPLANE INCLUDING THE EFFECT OF CONFORMAL FUEL TANKS
Billy Barnhart Washington NASA Apr. 1982 71 p refs
(Contract NAS1-16205)
(NASA-CR-3479; NAS 1.26:3479) Avail: NTIS HC A04/MF A01 CSCL 01A

F-15 rotary balance data was analyzed, and the influence of control deflections, Reynolds number and airplane components, i.e., body, wing, horizontal and vertical tails, as well as conformal tanks, on the aerodynamics up to 90 degrees angle of attack are discussed. Steady state spin mode predictions using these data are presented, which show excellent correlation with spin tunnel and flight test results. Generally, the data shows damped yawing moment slopes with rotation at all angles of attack, and good control effectiveness. Differences in the rotary aerodynamics due to the addition of conformal tanks are minimal. The small differences in the region of the flat spin do, however, indicate that the resulting spin mode would be slightly flatter and faster for a conformal tank equipped airplane. The addition of conformal tanks make the airplane more departure susceptible. S.L.

N82-22214*# Thermo Mechanical Systems Co., Canoga Park, Calif.
DEVELOPMENT OF A LOCALLY MASS FLUX CONSERVATIVE COMPUTER CODE FOR CALCULATING 3-D VISCOUS FLOW IN TURBOMACHINES Final Report
Leonard Walitt Apr. 1982 118 p refs
(Contract NAS3-20834; DA Proj. 1L1-62209-AH-76)
(NASA-CR-3539; NAS 1.26:3539; SR-34) Avail: NTIS HC A06/MF A01 CSCL 01A

The VANS successive approximation numerical method was extended to the computation of three dimensional, viscous, transonic flows in turbomachines. A cross-sectional computer code, which conserves mass flux at each point of the cross-sectional surface of computation was developed. In the VANS numerical method, the cross-sectional computation follows a blade-to-blade calculation. Numerical calculations were made for an axial annular turbine cascade and a transonic, centrifugal impeller with splitter vanes. The subsonic turbine cascade computation was generated in blade-to-blade surface to evaluate the accuracy of the blade-to-blade mode of marching. Calculated blade pressures at the hub, mid, and tip radii of the cascade agreed with corresponding measurements. The transonic impeller computation was conducted to test the newly developed locally mass flux conservative cross-sectional computer code. Both blade-to-blade and cross sectional modes of calculation were implemented for this problem. A triplet point shock structure was computed in the inducer region of the impeller. In addition, time-averaged shroud static pressures generally agreed with measured shroud pressures. It is concluded that the blade-to-blade computation produces a useful engineering flow field in regions of subsonic relative flow; and cross-sectional computation, with a locally mass flux conservative continuity equation, is required to compute the shock waves in regions of supersonic relative flow. M.G.

N82-22215*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECTS OF AXISYMMETRIC AND NORMAL AIR JET PLUMES AND SOLID PLUME ON CYLINDRICAL AFTERBODY PRESSURE DISTRIBUTIONS AT MACH NUMBERS FROM 1.65 TO 2.50
Peter F. Covell Apr. 1982 35 p refs
(NASA-TP-2005; L-14883; NAS 1.60:2005) Avail: NTIS HC A03/MF A01 CSCL 01A

A wind tunnel investigation of the interference effects of axisymmetric nozzle air plumes, a solid plume, and normal air jet plumes on the afterbody pressure distributions and base pressures of a cylindrical afterbody model was conducted at Mach numbers from 1.65 to 2.50. The axisymmetric nozzles, which varied in exit lip Mach number from 1.7 to 2.7, and the normal air jet nozzle were tested at jet pressure ratios from 1 (jet off) to 615. The tests were conducted at an angle of attack of 0 deg and a Reynolds number per meter of 6.56 million. The results of the investigation show that the solid plume induces greater interference effects than those induced by the axisymmetric nozzle plumes at the selected underexpanded design conditions. A thrust coefficient parameter based on nozzle lip conditons was found to correlate the afterbody disturbance distance and the base pressure between the different axisymmetric nozzles. The normal air jet plume and the solid plume induce afterbody disturbance distances similar to those induced by the axisymmetric air plumes when base pressure is held constant. B.W.

N82-22216# Acurex Corp., Mountain View, Calif.
THERMAL AND STRUCTURAL ANALYSIS OF TRAINING ROUND NOSE CAPS Final Report
M. J. Abbett, R. P. Duiven, B. Laub, and R. A. S. Beck May 1981 30 p refs
(Contract DAAG29-76-D-0100)
(AD-A100712; ARBRL-CR-00455) Avail: NTIS HC A03/MF A01 CSCL 01/1

The results of a brief computational study using the ABRES Shape Change Code, ASCC-79, to predict the effects of aerodynamic heating on an ablating nose cap configuration for the XM797 high velocity training round are presented. Ablation rates and in-depth thermal response were analyzed for three flight trajectories. Recommendations are made for experimental verification of the computational modeling. T.M.

N82-22217*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF NACELLES ON AERODYNAMIC CHARACTERISTICS OF AN EXECUTIVE-JET MODEL WITH SIMULATED, PARTIAL-CHORD, LAMINAR-FLOW-CONTROL WING GLOVE
Richard L. Campbell Apr. 1982 104 p refs
(NASA-TM-83271; L-14982; NAS 1.15:83271) Avail: NTIS HC A06/MF A01 CSCL 01A

Tests were conducted in the Langley High-Speed 7- by 10-Foot Tunnel using a 1/10-scale model of an executive jet to examine the effects of the nacelles on the wing pressures and model longitudinal aerodynamic characteristics. For the present investigation, each wing panel was modified with a simulated, partial-chord, laminar-flow-control glove. Horizontal-tail effects were also briefly examined. The tests covered a range of Mach numbers from 0.40 to 0.82 and lift coefficients from 0.20 to 0.55. Oil-flow photographs of the wing at selected conditions are included. Author

N82-22218*# Continuum, Inc., Huntsville, Ala.
A VARIATIONAL PRINCIPLE FOR COMPRESSIBLE FLUID MECHANICS. DISCUSSION OF THE ONE-DIMENSIONAL THEORY Interim Report
Robert Joel Prozan Washington NASA Apr. 1982 17 p
(Contract NAS1-16646)
(NASA-CR-3526; NAS 1.26:3526; CI-TR-0042) Avail: NTIS HC A02/MF A01 CSCL 01A

The second law of thermodynamics is used as a variational statement to derive a numerical procedure to satisfy the governing equations of motion. The procedure, based on numerical experimentation, appears to be stable provided the CFL condition is satisfied. This stability is manifested no matter how severe the gradients (compression or expansion) are in the flow field. For reasons of simplicity only one dimensional inviscid compressible unsteady flow is discussed here; however, the concepts and techniques are not restricted to one dimension nor are they restricted to inviscid non-reacting flow. The solution here is explicit in time. Further study is required to determine the impact of the variational principle on implicit algorithms. B.W.

N82-22219# Cambridge Univ. (England). Dept. of Engineering.
THE INTERACTION OF A WAKE WITH A BOUNDARY LAYER, DATA REPORT
Zhou MingDe and L. C. Squire 1981 61 p refs
(ISSN-0309-7293; CUED/A-Aero/TR-11) Avail: NTIS HC A04/MF A01

The influence of a wake on a boundary layer was studied. The effects associated with the various parameters of the airfoils were considered. Results for general flow conditions which include the development of interacting viscous layers in flow fields of zero and adverse pressure gradients are reported. The cases

studied included the mixing of an asymmetrical wake with a boundary layer, the influence of the shape of the profile of the upstream element and the influence of the normal distance between the wake center and the wall. Besides mean and fluctuating quantities in the flow fields, skin friction measurements were made in typical situations. Details of a method to improve the accuracy of data from a cross hot wire probe are given. Details of the basic boundary layers without a wake are also presented for comparison. M.D.K.

N82-22220# Cambridge Univ. (England). Dept. of Engineering.

AN ACTUATOR DISC ANALYSIS OF UNSTEADY SUPERSONIC CASCADE FLOW

D. S. Whitehead 1981 26 p refs

(ISSN-0309-6521) Avail: NTIS HC A03/MF A01

Aerodynamic forces and moments acting on a cascade of unloaded flat plates vibrating in a supersonic flow are analyzed. The principal assumptions are that the axial velocity is subsonic, that the blades are sufficiently closely spaced so that a Mach wave cannot propagate upstream through the cascade, and that the frequency parameter and interblade phase angle are both small. The unique incidence condition is used. Bending vibration is always damped, but flutter in pure torsion is always predicted. S.L.

N82-22221# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Apparate.

AERODYNAMIC CHARACTERISTICS OF BODIES WITH RECTANGULAR CROSS SECTION

H. G. Knoche, W. Schamel, H. Esch (DFVLR, Cologne), and W. Schneider (DFVLR, Cologne) 22 Dec. 1980 15 p refs Sponsored by West German Ministry of Defence

(MBB-UA-570-81-O) Avail: NTIS HC A02/MF A01

Systematic wind tunnel tests were conducted on a series of bodies with varying cross section shape and body length in the subsonic Mach number range and up to high angles of attack. In addition some tests with a body-wing, body-tail configuration were performed in order to investigate the body-wing and body-tail interference for bodies of revolution and bodies with rectangular cross section. The application of bodies with rectangular cross section in missile design is addressed. Specific factors discussed include advantages and disadvantages, aerodynamic requirements, wind tunnel tests and critical review of the obtained results and comparison of test results with existing theoretical methods. J.M.S.

N82-22222# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

SOME CHARACTERISTIC QUANTITIES OF THE FIRST MUELLER PROFILE [ENIGE KARAKTERISTIEKE GROOTHEDEN VAN HET EERSTE PROFIEL VAN MUELER]

J. J. H. Blom Jun. 1981 40 p refs In DUTCH

(VTH-LR-325) Avail: NTIS HC A03/MF A01

The characteristics of the first Mueller airfoil profile were theoretically studied. For the first Mueller profile, the characteristics, determining the form of the profile (profile nose dimensions, maximum thickness and its position, slopes of tail, and curvature), are expressed as a function of transformation variables. The figures and relations given enable a good choice of the required starting profile. The form of the first Mueller profile is compared with the corresponding von Karman-Trefftz profile. The first Mueller profile has a larger profile thickness and a more convex nose form than the von Karman-Trefftz profile with identical tail slope, curvature and thickness parameter, while the maximum thickness is located more to the front. Author (ESA)

N82-22223# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Entwurfsaerodynamik.

DRAG REDUCTION USING PNEUMATIC TURBULATORS

Karl-Heinz Horstmann and Armin Quast Sep. 1981 54 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-743)

(DFVLR-FB-81-33) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 11,40

Reduction of the additional drag, caused by laminar separation bubbles in airfoils and fuselages at Reynolds numbers below 5 million, was investigated theoretically and experimentally. By blowing from a row of holes located at the separation line, the laminar bubble is destroyed and drag is reduced considerably. Drag reduction due to blowing is naturally smaller at lower Reynolds numbers, the bubbles being smaller. The Reynolds number range with low section drag increases if pneumatic turbulators are used in the profile design. Author (ESA)

N82-22224# National Aerospace Lab., Amsterdam (Netherlands). Flight Dynamics Div.

AEROELASTIC PROPERTIES OF WINGS IN TRANSONIC FLOW

R. J. Zwaan 24 Feb. 1981 51 p refs Presented at Lecture Ser. on Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow, Rhode-St.-Genese, Belgium, 9-13 Mar. 1981

(NLR-MP-81005-U) Avail: NTIS HC A04/MF A01

Literature on transonic flutter characteristics of wings, especially the transonic dip phenomenon in the flutter boundaries, was reviewed. The transonic dip occurs most distinctly with sweptback wings. The dip is caused by the phase lag of the lift due to the fundamental wing bending mode and corresponds to a single-mode flutter mechanism. The dip can be predicted qualitatively using methods for inviscid transonic unsteady air loads. Quasi-steady transonic methods are not wholly reliable. The dip becomes relatively deeper with increasing wing-to-air mass ratio. The dip can become more pronounced for a supercritical wing than for a conventional wing. The dip occurs at design conditions as well as off-design conditions. In case of flow separation, a narrow dip which depends strongly on boundary layer conditions and the spatial distribution of the separated flow can occur. Author (ESA)

N82-22225# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.

AEROSPATIALE SURVEY OF WIND TUNNEL TESTING OF SMALL AND LARGE SCALE ROTORS

J. P. Silvani and A. Vuillet Paris 1981 17 p refs Presented at the 7th European Rotocraft And Powered Lift Aircraft Forum, Garmisch-Partenkirchen, West Germany 8-11 Sep. 1981; sponsored by DFVLR, Cologne

(SNIAS-821-210-107) Avail: NTIS HC A02/MF A01

Wind tunnel tests on Mach scaled rotors (1/10 and 1/3) capable of a wide range of shaft angle settings are summarized. The 1/3 model hub is fitted with a swashplate, general and cyclic inputs. Continuous conversion of a tilt rotor was achieved. Speeds > 500 km/hr were attained with conventional rotors. During autorotation high lift coefficients are obtained without major drag penalties. The OA family 2-D airfoils characteristic improvements were checked. Results show good behaviour throughout the entire rotor flight envelope; a 3% improvement on the rotor figure of merit at nominal thrust in hover; a 9% power improvement at nominal thrust and 300 km/hr in level fight; and 12% maximum thrust improvement at stall.

Author (ESA)

N82-22226# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).

LAMINAR BOUNDARY LAYERS IN THE VICINITY OF THE ATTACHMENT LINE ON WINGS AND WINGLIKE BODIES AT INCIDENCE Ph.D. Thesis - Technische Hochschule Aachen

Dieter Schwamborn Aug. 1981 158 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-752)

(DFVLR-FB-81-31) Avail: NTIS HC A08/MF A01; DFVLR, Cologne DM 29,80

A three dimensional model of the boundary layer flow in the vicinity of the leading edge of winglike bodies was developed with special emphasis on the flow characteristics close to the attachment line. The three dimensional laminar and incompressible flow equations around on ellipsoid are solved by finite difference methods. For the integration of these equations close to the attachment line, a difference scheme is presented, the stability and convergence of which are discussed. The existence of quasi-two dimensional streamlines outside the flow symmetry plane is treated. Results of computations for different angles of attack are shown. Computations proceed until detachment occurs.

The existence of a pressure maximum and a shear stress minimum in the vicinity of the attachment line is established.
Author (ESA)

N82-22146# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
REMARKS ON AXISYMMETRIC VORTEX BREAKDOWN
R. Legendre *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-5, Sep. - Oct. 1981 (ESA-TT-725) Feb. 1982 p 1-9 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), No. 1981-5, Sep. - Oct. 1981 (For primary document see N82-22145 13-01)
Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 45

N82-22157# Centre d'Essais Aeronautique Toulouse (France).
PROGRESS IN ELABORATING TEST PROGRAMS FOR A MECHANICAL ENVIRONMENT [PROGRES DANS L'ELABORATION DES PROGRAMMES D'ESSAIS D'ENVIRONNEMENT MECANIQUE]
M. Coquelet *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 16 p refs In FRENCH (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

N82-22199# Vought Corp., Dallas, Tex. Aerodynamics Div.
PREDICTIONS OF AERODYNAMIC CHARACTERISTICS OF HIGHLY MANEUVERABLE CONFIGURATIONS
W. B. Brooks and T. D. Beatty *In* AGARD Combat Aircraft Maneuverability Dec. 1981 6 p refs (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

N82-22974# Societe Bertin et Cie, Plaisir (France).
BEHAVIOR OF A HELMHOLTZ RESONATOR WITH FLEXIBLE SIDES IN THE PRESENCE OF HYDRODYNAMIC TUNNEL FLOW [COMPORTEMENT D'UN RESONATEUR D'HELMHOLTZ A PAROIS DEFORMABLES EN PRESENCE D'ECOULEMENT HYDRODYNAMIQUE EN TUNNEL]
Daniel Leducq *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 6 p In FRENCH (For primary document see N82-22957 13-71)
Avail: NTIS HC A08/MF A01

N82-23126*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AN ANALYTIC SOLUTION TO THE CLASSICAL TWO-BODY PROBLEM WITH DRAG Final Report
Don Mittleman (Oberlin Coll.) and Don Jezewski *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 22 p refs (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 01A

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N82-22227*# Douglas Aircraft Co., Inc., Long Beach, Calif.
TRANSPORT AIRCRAFT ACCIDENT DYNAMICS Final Technical Report, 11 Feb. 1980 - Mar. 1982
A. Cominsky Atlantic City FAA Mar. 1982 178 p
(Contract NAS1-16111)
(NASA-CR-165850; FAA-RD-74-12; NAS 1.26:165850) Avail: NTIS HC A09/MF A01 CSCL 01C

A study was carried out of 112 impact survivable jet transport aircraft accidents (world wide) of 27,700 kg (60,000 lb.) aircraft and up extending over the last 20 years. This study centered on the effect of impact and the follow-on events on aircraft structures and was confined to the approach, landing and takeoff segments of the flight. The significant characteristics, frequency of occurrence and the effect on the occupants of the above data base were studied and categorized with a view to establishing typical impact scenarios for use as a basis of verifying the effectiveness of potential safety concepts. Studies were also carried out of related subjects such as: (1) assessment of advanced materials; (2) human tolerance to impact; (3) merit functions for safety concepts; and (4) impact analysis and test methods.
Author

N82-22228*# Boeing Aerospace Co., Houston, Tex.
A SYSTEM SAFETY MODEL FOR DEVELOPMENTAL AIRCRAFT PROGRAMS
Emil J. Amberboy and Robert L. Stokeld Washington NASA Apr. 1982 84 p refs
(Contract NAS2-10361)
(NASA-CR-3534; NAS 1.26:3534) Avail: NTIS HC A05/MF A01 CSCL 01C

Basic tenets of safety as applied to developmental aircraft programs are presented. The integration of safety into the project management aspects of planning, organizing, directing and controlling is illustrated by examples. The basis for project management use of safety and the relationship of these management functions to 'real-world' situations is presented. The rationale which led to the safety-related project decision and the lessons learned as they may apply to future projects are presented.
N.W.

N82-22229# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Abteilung Flugverkehrswissenschaft.
DEVELOPMENTAL POSSIBILITIES AND RESTRICTIONS IN AIR TRANSPORT
Aug. 1981 91 p In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-744)
(DFVLR-Mitt-81-9) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 16,20

The possibilities of creating or maintaining an efficient air transport system in the present political, economical and technical situation were assessed. Future developments in demand and supply in commercial air transport and questions related to transport policy, airport planning and supply organization of air carriers are discussed. For individual titles, see N82-22230 through N82-22233.

N82-22230# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Abteilung Flugverkehrswissenschaft.
DEVELOPMENTAL POSSIBILITIES IN CIVIL AVIATION IN THE FEDERAL REPUBLIC OF GERMANY [ENTWICKLONGSMOEGLICHKEITEN IM GEWERBLICHEN LUFTVERKEHR DER BUNDESREPUBLIK DEUTSCHLAND]
H.-G. Nuesser *In its* Develop. Possibilities and Restrictions in Air Transport Aug. 1981 p 11-46 In GERMAN (For primary document see N82-22229 13-03)
Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 16,20

The results of a prognosis was made on the evolution of air traffic until the year 2000 in Germany. Travel motives, flight type, region, season and traffic paths are forecasted. Data are used to derive the required evolution in the supply of passenger and cargo flights. The forecast includes a 5% annual increase in passenger traffic, reaching in the year 2000 a total number of some 765,000 starts and take offs at a seating capacity of about 60%. Forecasts for individual airports are also included.
Author (ESA)

N82-22231# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
POSSIBILITIES FOR THE FUTURE DEVELOPMENT OF AIR TRAFFIC IN THE EUROPEAN COMMUNITY [MOEGLICHKEITEN FUER DIE KUENFTIGE GESTALTUNG DES LUFTVERKEHRS IN DER EG]
J. Erdmenger (Commission of European Communities) *In its* Develop. Possibilities and Restrictions in Air Transport Aug. 1981 p 47-60 In GERMAN (For primary document see N82-22229 13-03)
Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 16,20

The European dimension of the air traffic in Germany and the development of a European policy on air transportation are

discussed. The consequences of the convention of Chicago and the European views on deregulation and open sky policy are outlined. Both are discussed in light of the specific European situation. An important future role for the European Commission is seen in the creation of regional air traffic and the negotiation of European air tariffs. Author (ESA)

N82-22232# Flughafen G.m.b.H., Hamburg (West Germany).
TRAFFIC INTRASTRUCTURE: CAN PLANNING STILL BE CARRIED THROUGH [VERKEHRSINFRASTRUKTUR: IST PLANUNG NOCH DURCHSTEZBAR?]
U. Christiansen *In* DFVLR Develop. Possibilities and Restrictions in Air Transport Aug. 1981 p 61-66 In GERMAN (For primary document see N82-22229 13-03)
Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 16,20

The problems facing German airport authorities in planning either to extend existing, or to create new airports are analyzed. In addition to the growing environmental awareness by the public, the procedures for approval at various administrative and juridical levels are identified as the major reason for the considerable delays encountered in recent projects. Several proposals are formulated for simplification and shortening these procedures. Author (ESA)

N82-22233# Deutsche Lufthansa Aktiengesellschaft, Cologne (West Germany).
THE SUPPLIER: COERCIVE MEASURES AND CHANCES [DET ANBIETER: ZWAENGE UND CHANCEN]
R. Abraham *In* DFVLR Develop. Possibilities and Restrictions in Air Transport Aug. 1981 p 67-81 In GERMAN (For primary document see N82-22229 13-03)
Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 16,20

The future development in the supply of air transportation in Germany is reviewed. Several stringent boundary conditions are identified: fuel costs, economic situation, tariff concurrence, environmental awareness and air traffic safety. The fuel savings program of Lufthansa through which the consumption per produced ton kilometer could be reduced by 30% over 7 years is discussed. The dynamic nature of the air carrier industry and the importance of civil aviation for the world economy is thought to guarantee success also in the coming decades. Author (ESA)

N82-22234# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.
POINT OF VIEW OF A HELICOPTER MANUFACTURER ON AIRWORTHINESS REGULATIONS
Jean Boulet Paris 1981 4 p Presented at 7th European Rotorcraft and Powered Lift Aircraft Forum, Garmisch-Partenkirchen, West Germany, 8-11 Sep. 1981
(SNIAS-821-210-103) Avail: NTIS HC A02/MF A01

Advice on drafting airworthiness regulations based on personal experience in the helicopter industry is forwarded. Examples of French and American procedures are quoted. Regulations must be drafted and modified through constant consultation between civil aviation authorities and manufacturers. A single, international set of regulations and a single demonstration of compliance with the regulations is advocated. The probability factor permissible for a serious accident should be set at a realistic level. In this manner it is possible to reconcile a continuously improved safety level with a progressive reduction in helicopter costs. Author (ESA)

N82-22235# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Abt. Flugverkehrswissenschaft.
COMMERCIAL AIR TRANSPORTATION IN THE FEDERAL REPUBLIC OF GERMANY: 1975 - 1990 - 2000
Dieter Wilken, Klaus Bachmann, Eckhard Urbatzka, and Horst Focke Nov. 1981 549 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-81-36) Avail: NTIS HC A23/MF A01; DFVLR, Cologne DM 87,50

Volume and structure of present passenger travel and aircraft movements for German airports are analyzed and their future evolution is forecast. Region and travel purpose specific demand segments serve as a basis for estimating passenger flow on scheduled and charter air services for the year 1990 and beyond. Traffic flows are assigned to routes and converted into aircraft movements for several supply variants. Air transport through German airports is expected to grow from 35.7 million passengers in 1975 to about 75 million in 1990. This growth can partly be met by raising capacities and load factors of aircraft such that aircraft mileage increases only 30% Author (ESA)

N82-22236# National Transportation Safety Board, Washington, D. C.
SPECIAL INVESTIGATION REPORT: EVACUATION OF UNITED AIRLINES DC-8-61, SKY HARBOR INTERNATIONAL AIRPORT, PHOENIX, ARIZONA, DECEMBER 29, 1980
9 Sep. 1981 29 p refs
(PB82-115619; NTSB-SIR-81-4) Avail: NTIS HC A03/MF A01 CSCL 01B

On December 29, 1980, United Airlines Charter Flight 5820, a DC-8-61, with 238 passengers and a crew of 9, was evacuated at Sky Harbor International Airport, Phoenix, Arizona, when the failure of the rear landing gear bogie beam resulted in a fire in the aircraft's right main landing gear. The cockpit crew was erroneously advised of an engine fire by the airport tower and began emergency shutdown procedures. The captain initiated the evacuation after all electrical power had been shut down and the public address and cabin interphone systems were without power. Therefore, the second officer had to give the evacuation orders to passengers and flight attendants by 'word of mouth'. As a result of its special investigation and its previous work on the subject of evacuations, the Safety Board has made recommendations to the Federal Aviation Administration to improve the availability of emergency communication equipment and to promote its use. GRA

N82-22237# National Transportation Safety Board, Washington, D. C.
REVIEW OF ROTORCRAFT ACCIDENTS 1977-1979
11 Aug. 1981 59 p
(PB82-115601; NTSB-AAS-81-1) Avail: NTIS HC A04/MF A01 CSCL 01B

Accident data on the rotorcraft, pilots and operating environment which may be most useful to designers, manufacturers, operators and regulators are presented. Tables and graphs presenting accident statistics, cause/factors, rotorcraft make and model data, pilot experience and weather conditions are included. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N82-22238*# Ohio State Univ., Columbus.
A TACTUAL DISPLAY AID FOR PRIMARY FLIGHT TRAINING Final Report, 1 Jul. 1975 - 15 Dec. 1978
Richard D. Gilson Jul. 1979 76 p refs
(Contract NAS2-8954)
(NASA-CR-166242; NAS 1.26:166242) Avail: NTIS HC A05/MF A01 CSCL 01D

A means of flight instruction is discussed. In addition to verbal assistance, control feedback was continously presented via a nonvisual means utilizing touch. A kinesthetic-tactile (KT) display was used as a readout and tracking device for a computer generated signal of desired angle of attack during the approach and landing. Airspeed and glide path information was presented via KT or visual heads up display techniques. Performance with the heads up display of pitch information was shown to be significantly better than performance with the KT pitch display. Testing without the displays showed that novice pilots who had received tactile pitch error information performed both pitch and throttle control tasks significantly better than those who had

received the same information from the visual heads up display of pitch during the test series of approaches to landing. Author

N82-22239*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECTS OF CABLE GEOMETRY AND AIRCRAFT ATTITUDE ON THE ACCURACY OF A MAGNETIC LEADER CABLE SYSTEM FOR AIRCRAFT GUIDANCE DURING ROLLOUT AND TURNOFF
W. Thomas Bundick Apr. 1982 32 p refs
(NASA-TP-1978; L-14975; NAS 1.60:1978) Avail: NTIS HC A03/MF A01 CSCL 17G

A theoretical analysis of a single wire magnetic leader cable system for aircraft rollout and turnoff guidance was performed to determine the errors produced by the leader cable installation geometry and aircraft attitude. It was found that errors in the measurement of lateral displacement from the cable are smaller than errors in the measurement of aircraft heading and that both errors are smallest at or near the cable. Author

N82-22240*# California Univ., Berkeley. Inst. of Transportation Studies.
MEASURES TO INCREASE AIRFIELD CAPACITY BY CHANGING AIRCRAFT RUNWAY OCCUPANCY CHARACTERISTICS
Geoffrey D. Gosling, Abid Kanafani, and Stephen L. M. Rockaday Dec. 1981 218 p refs
(Grant NAG2-19)
(NASA-CR-168841; NAS 1.26:168841; UCB-ITS-RR-81-7) Avail: NTIS HC A10/MF A01 CSCL 17G

Airfield capacity and aircraft runway occupancy characteristics were studied. Factors that caused runway congestion and airfield crowding were identified. Several innovations designed to alleviate the congestion are discussed. Integrated landing management, the concept that the operation of the final approach and runway should be considered in concert, was identified as underlying all of the innovations. R.J.F.

N82-22241# Aeronautical Research Labs., Melbourne (Australia).
STRAPDOWM INERTIAL NAVIGATION SYSTEMS: AN ALGORITHM FOR ATTITUDE AND NAVIGATION COMPUTATIONS
R. B. Miller 1981 33 p refs
(ARL/Sys-Rept-23; AR-002-265) Avail: NTIS HC A03/MF A01

Vehicle attitude is maintained through quaternions, which are updated by a modified third order method. The navigation part of the algorithm uses a split frame technique whereby body related quantities are evaluated in body axis coordinates, and navigation frame related quantities are evaluated in navigation axis coordinates. The algorithm is partitioned into three sections which are performed at different rates according to the application. T.M.

N82-22242# Royal Aircraft Establishment, Farnborough (England).
AIRFIELD VISUAL AIDS RESEARCH AT THE ROYAL AIRCRAFT ESTABLISHMENT
A. J. Smith 2 Oct. 1981 29 p refs Presented at the 1981 Aviation Lighting Sen., Williamsburg, Virginia, 9-13 Nov. 1981; Sponsored by Illuminating Engineering Society of North America
(RAE-TM-FS-431; BR80893) Avail: NTIS HC A03/MF A01

The precision approach path indicator (PAPI) is described and helicopter lighting aids are discussed. The PAPI system indicates correct glide slope at ranges > 10 km under good visibility conditions and provides information up to 300 m from touchdown. Two color light projector units, consisting of three simple optical projectors side by side in a box, tell the pilot if he is too high, too low, or on slope by the combination of red and white lights. Trials show that it can be used by a wide range of civil and military aircraft, e.g., the VC-10, small private airplanes, or helicopters. A mathematical model which predicts what pilots can see when landing in fog was used in order to optimize proposed approach lighting patterns for helicopters. If the lighting pattern is 730 m long, initial contact is possible at altitudes > 100 m. Lighting trials show that red stop bar lighting and green taxiway centerline need further improvement. Author (ESA)

N82-22194# General Dynamics/Fort Worth, Tex. Engineering Div.
INTEGRATION OF AVIONICS AND ADVANCED CONTROL TECHNOLOGY
M. E. Waddoups and C. A. Anderson *In* AGARD Combat Aircraft Maneuverability Dec. 1981 4 p (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N82-22243*# Aeronautical Research Associates of Princeton, Inc., N. J.
ANALYSIS AND FLIGHT EVALUATION OF A SMALL, FIXED-WING AIRCRAFT EQUIPPED WITH HINGED PLATE SPOILERS
John W. Olcott, Edward Sackel, and David R. Ellis Sep. 1981 161 p refs
(Contract NAS2-5589)
(NASA-CR-166247; NAS 1.26:166247) Avail: NTIS HC A08/MF A01 CSCL 01C

The results of a four phase effort to evaluate the application of hinged plate spoilers/dive brakes to a small general aviation aircraft are presented. The test vehicle was a single engine light aircraft modified with an experimental set of upper surface spoilers and lower surface dive brakes similar to the type used on sailplanes. The lift, drag, stick free stability, trim, and dynamic response characteristics of four different spoiler/dive brake configurations were determined. Tests also were conducted, under a wide range of flight conditions and with pilots of various experience levels, to determine the most favorable methods of spoiler control and to evaluate how spoilers might best be used during the approach and landing task. The effects of approach path angle, approach airspeed, and pilot technique using throttle/spoiler integrated control were investigated for day, night, VFR, and IFR approaches and landings. The test results indicated that spoilers offered significant improvements in the vehicle's performance and flying qualities for all elements of the approach and landing task, provided a suitable method of control was available. Author

N82-22244*# Sinacori (John B.) Associates, Hollister, Calif.
CONCEPTUAL DESIGN STUDY OF A VISUAL SYSTEM FOR A ROTORCRAFT SIMULATOR AND SOME ADVANCES IN PLATFORM MOTION UTILIZATION Final Report
John B. Sinacori Aug. 1980 33 p refs
(Contract NAS2-10278)
(NASA-CR-166322; NAS 1.26:166322) Avail: NTIS HC A03/MF A01 CSCL 14B

A conceptual design of a visual system for a rotorcraft flight simulator is presented. Also, drive logic elements for a coupled motion base for such a simulator are given. The design is the result of an assessment of many potential arrangements of electro-optical elements and is a concept considered feasible for the application. The motion drive elements represent an example logic for a coupled motion base and is essentially an appeal to the designers of such logic to combine their washout and braking functions. Author

N82-22245*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A LINEAR DECOMPOSITION METHOD FOR LARGE OPTIMIZATION PROBLEMS. BLUEPRINT FOR DEVELOPMENT
Jaroslaw Sobieszczanski-Sobieski Feb. 1982 61 p refs
(NASA-TM-83248; NAS 1.15:82348) Avail: NTIS HC A04/MF A01 CSCL 01C

A method is proposed for decomposing large optimization problems encountered in the design of engineering systems such as an aircraft into a number of smaller subproblems. The decomposition is achieved by organizing the problem and the subordinated subproblems in a tree hierarchy and optimizing each subsystem separately. Coupling of the subproblems is accounted for by subsequent optimization of the entire system based on sensitivities of the suboptimization problem solutions at each level of the tree to variables of the next higher level. A formalization of the procedure suitable for computer implementation is developed and the state of readiness of the implementation building blocks is reviewed showing that the ingredients for the development are on the shelf. The decomposition method is also shown to be compatible with the natural human organization of the design process of engineering systems. The method is also examined with respect to the trends in computer hardware and software progress to point out that its efficiency can be amplified by network computing using parallel processors. B.W.

N82-22246*# National Aeronautics and Space Administration, Washington, D. C.
REVOLUTION IN AIRPLANE CONSTRUCTION? GROB G110: THE FIRST MODERN FIBER GLASS COMPOSITION AIRPLANE SHORTLY BEFORE ITS MAIDEN FLIGHT
R. Dorpinghaus Mar. 1982 19 p Transl. into ENGLISH from Aerokurier (West Germany), no. 12, Dec. 1981 p 1550-1555 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-76705; NAS 1.15:76705) Avail: NTIS HC A02/MF A01 CSCL 01C

A single engine two passenger airplane, constructed completely from fiber reinforced plastic materials is introduced. The cockpit, controls, wing profile, and landing gear are discussed. Development of the airframe is also presented. S.L.

N82-22247*# National Aeronautics and Space Administration, Washington, D. C.
SOCATA: TB 20 TRINIDAD GIVEN GERMAN DEBUT
B. Malzbender Mar. 1982 13 p Transl. into ENGLISH from Aerokurier (West Germany), no. 12, Dec. 1981 p 1543, 1546-1547 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-76706; NAS 1.15:76706) Avail: NTIS HC A02/MF A01 CSCL 01C

Pilot impressions gained in a first flight in the 250 HP single engine TB 20 prototype aircraft are presented along with aircraft specifications. A.R.H.

N82-22248*# Systems Technology, Inc., Hawthorne, Calif.
FUNCTIONAL REQUIREMENTS FOR THE MAN-VEHICLE SYSTEMS RESEARCH FACILITY
Warren F. Clement, R. Wade Allen, Robert K. Heffley, Wayne F. Jewell, Henry R. Jex, Duane T. McRuer, Ted M. Schulman, and Robert L. Stapleford Oct. 1980 221 p refs
(Contract NAS2-10400)
(NASA-CR-166315; NAS 1.26:166315; TR-1156-3) Avail: NTIS HC A10/MF A01 CSCL 01C

The NASA Ames Research Center proposed a man-vehicle systems research facility to support flight simulation studies which are needed for identifying and correcting the sources of human error associated with current and future air carrier operations. The organization of research facility is reviewed and functional requirements and related priorities for the facility are recommended based on a review of potentially critical operational scenarios. Requirements are included for the experimenter's simulation control and data acquisition functions, as well as for the visual field, motion, sound, computation, crew station, and intercommunications subsystems. The related issues of functional fidelity and level of simulation are addressed, and specific criteria for quantitative assessment of various aspects of fidelity are offered. Recommendations for facility integration, checkout, and staffing are included. A.R.H.

N82-22249*# Systems Technology, Inc., Hawthorne, Calif.
TECHNICAL APPROACHES FOR MEASUREMENT OF HUMAN ERRORS Final Report
Warren F. Clement, Robert K. Heffley, Wayne F. Jewell, and Duane T. McRuer May 1980 140 p refs
(Contract NAS2-10400)
(NASA-CR-166314; NAS 1.26:166314; STI-TR-1156-2) Avail: NTIS HC A07/MF A01 CSCL 01C

Human error is a significant contributing factor in a very high proportion of civil transport, general aviation, and rotorcraft accidents. The technical details of a variety of proven approaches for the measurement of human errors in the context of the national airspace system are presented. Unobtrusive measurements suitable for cockpit operations and procedures in part of full mission simulation are emphasized. Procedure, system performance, and human operator centered measurements are discussed as they apply to the manual control, communication, supervisory, and monitoring tasks which are relevant to aviation operations. S.L.

N82-22250*# Systems Technology, Inc., Hawthorne, Calif.
A THEORY OF HUMAN ERROR Final Report
Duane T. McRuer, Warren F. Clement, and R. Wade Allen May 1980 91 p refs
(Contract NAS2-10400)
(NASA-CR-166313; NAS 1.26:166313; STI-TR-1156-1) Avail: NTIS HC A05/MF A01 CSCL 01C

Human error, a significant contributing factor in a very high proportion of civil transport, general aviation, and rotorcraft accidents is investigated. Correction of the sources of human error requires that one attempt to reconstruct underlying and contributing causes of error from the circumstantial causes cited in official investigative reports. A validated analytical theory of the input-output behavior of human operators involving manual control, communication, supervisory, and monitoring tasks which are relevant to aviation operations is presented. This theory of behavior, both appropriate and inappropriate, provides an insightful basis for investigating, classifying, and quantifying the needed cause-effect relationships governing propagation of human error. B.W.

N82-22251*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PERFORMANCE TESTING OF A MAIN ROTOR SYSTEM FOR A UTILITY HELICOPTER AT 1/4 SCALE
John D. Berry (Army Aviation Research and Development Command, Langley, Va.) Apr. 1982 49 p refs
(DA Proj. 1L1-61102-AH-45)
(NASA-TM-83274; L-15015; NAS 1.15:83274; AVRADCOM-TR-82-B-3) Avail: NTIS HC A03/MF A01 CSCL 01C

Two rotor systems for the UH-1 helicopter were tested in hover and forward flight. The baseline system was a dynamically scaled model of the current rotor system, while the other system was designed for advanced performance. In hover out of ground effect, the advanced rotor system shows improvements up to 10 percent in the figure of merit and improvements in thrust up to 7 percent. In forward flight, the advanced rotor system demonstrated reductions in required torque throughout the range of conditions tested, with reductions up to 17 percent occurring at the higher advance ratios and higher lift values tested. T.M.

N82-22252*# Hydraulic Research Textron, Valencia, Calif.
AN ELECTRONIC CONTROL FOR AN ELECTROHYDRAULIC ACTIVE CONTROL LANDING GEAR FOR THE F-4 AIRCRAFT Final Report
Irving Ross Washington Apr. 1982 92 p refs
(Contract NAS1-16420)
(NASA-CR-3552; NAS 1.26:3552; HR-74600000) Avail: NTIS HC A05/MF A01 CSCL 01C

A controller for an electrohydraulic active control landing gear was developed for the F-4 aircraft. A controller was modified for this application. Simulation results indicate that during landing and rollout over repaired bomb craters the active gear effects a force reduction, relative to the passive gear, or approximately 70%. S.L.

N82-22253# British Aerospace Aircraft Group, Weybridge (England).
TAILOR-MADE STRUCTURES; TODAY, AND TOMORROW: NEW MATERIALS, AN EXPLORATORY INVESTIGATION INTO THEIR POTENTIAL USE

W. J. Bird 16 Apr. 1980 48 p
(BAe-SDW-85/A/104/005) Avail: NTIS HC A03/MF A01

The use of fiber/matrix combinations, e.g. in a nonmetallic airplane, is discussed. The development of fiber/matrix structures is hindered by an absence of design experience, designers whose experience is in metallics rather than textiles, the conservative structures employed, and production times for fiber components. A modular tooling system is proposed. The structural feasibility of the aircraft is established by examining the possibility of constructing VC-10 components in fiber/matrix materials.
Author (ESA)

N82-22254# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.

A COMPLETE METHOD FOR COMPUTATION OF BLADE MODE CHARACTERISTICS AND RESPONSES IN FORWARD FLIGHT

J. P. Lefrancq and B. Masure Paris 1981 10 p refs Presented at 7th European Rotorcraft and Powered Lift Aircraft Forum, Garmisch-Partenkirchen, West Germany 8-11 Sep. 1981; sponsored by DFVLR, Cologne
(SNIAS-821-210-101) Avail: NTIS HC A02/MF A01

The modal approach to rotor dynamic behavior is outlined, and an azimuth method is presented. The azimuth method applies to stabilized flights, in particular those in which rotor configuration is considered repeatable after one revolution. Excitation occurs at rotor frequency (R+F) or at multiples of it. Rotor behavior is developed in a Fourier series of which basic frequency is R+F. The series terms are considered negligible beyond the nth harmonic. Development coefficient counts show that (2n+1) successive positions (azimuths), regularly spread over the revolution, can describe rotor behavior. Accuracy depends on the number n of harmonics retained. The n number selection depends on computer capacity. Author (ESA)

N82-22255# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.

NAVAL VERSIONS OF THE DAUPHIN AND THE AS 15 TT WEAPON SYSTEM

J. P. Dubreuil Paris 1981 11 p Presented at the 7th European Rotorcraft and Powered Lift Aircraft Forum, Garmisch-Partenkirchen, West Germany, 8-11 Sep. 1981; sponsored by DFVLR, Cologne
(SNIAS-821-210-104) Avail: NTIS HC A02/MF A01

Modifications needed to adapt the Dauphin N helicopter for naval rescue and attack missions are outlined. The antisurface vessel weapon system is described. Maximum continuous engine power is increased from 437 to 468 kW, takeoff power from 492 to 552. Pressure refueling is possible in-flight or on-ground. Blades and fin fold. A hydraulic mooring harpoon is located between the two wheels of the main landing gear. A radar system, adopted from army versions, provides overall accuracy > 3% of distance covered. The tail assembly is watertight. The AS 15 TT has a range > 15 km, is roll stabilized, has a 30 kg warhead, and flies a few m above the surface, descending near the target just before impact. Author (ESA)

N82-22256# Societe Nationale Industrielle Aerospatiale, La Courneuve (France). Helicopter Div.

A LIGHT HELICOPTER FOR NIGHT FIRING

J. F. Candau Paris 1981 19 p Presented at the 7th European Rotorcraft and Powered Lift Aircraft Forum, Garmisch-Partenkirchen, West Germany, 8-11 Sep. 1981; sponsored by DFVLR, Cologne
(SNIAS-821-210-105) Avail: NTIS HC A02/MF A01

An antitank helicopter suitable for night operation over difficult terrain is described. A Dauphin helicopter, equipped with HOT missiles, is treated with low IR reflectance paint and antireflective coating of glazed areas. Jet exhaust is deviated, engine cowlings reduce IR emission. Targets are sought by a passive system of thermal imagery. Outside surroundings are viewed via a nocturnal vision device operating on the light intensification principle. The navigation system is self-contained. The missile is guided by a localizer coupled to, and harmonized with a thermal camera, mounted on a gyrostabilized platform. Tanks are detected up to 4 km and identified up to 2 km.
Author (ESA)

N82-22257# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.

CONCEPT STUDIES OF AN ADVANCED COMPOSITE HELICOPTER FIN

A. Desmonceaux and M. Torres Paris 1981 13 p Presented at the 7th European Rotorcraft and Powered Lift Aircraft Forum, Garmisch-Partenkirchen, West Germany, 8-11 Sep. 1981; sponsored by DFVLR, Cologne
(SNIAS-821-210-106) Avail: NTIS HC A02/MF A01

A composite fin and fan in fin assembly was developed for the Dauphin 2. The structure is made of epoxy resin preimpregnated Kevlar or graphite, single or two direction fiber cloths. A single block construction is used in heavily loaded areas or areas stabilized through a sharp curvature. A sandwich construction with Nomex honeycomb filler is used where loads are less. Static tests and theoretical studies show that maximum thrust is increased by 40% compared with a similar weight metal structure. Production costs are reduced by eliminating a great number of parts and assemblies. Operating costs are lowered by abolishing corrosion risks and improving maintenance through the simpler design. The fail safe composites increase safety. Author (ESA)

N82-22258# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.

TAIL ROTOR STUDIES FOR SATISFACTORY PERFORMANCE: STRENGTH AND DYNAMIC BEHAVIOR

G. Blachere and F. dAmbra Paris 1981 13 p refs Presented at 7th European Rotocraft and Powered Lift Aircraft Forum, Garmisch-Partenkirchen, West Germany 8-11 Sep. 1981; sponsored by DFVLR, Cologne
(SNIAS-821-210-108) Avail: NTIS HC A02/MF A01

Flexbeam, teetered, cantilevered and semirigid two bladed rotors were studied in flight, on whirl test stands and theoretically. The blades are compared with conventional helicopter blades. For 2 ton helicopters, the tested blades have fewer parts, and weigh less than conventional ones. Blade life is increased, manufacturing and maintenance costs are lowered. For 8 ton helicopters, similar improvements were achieved, but at the expense of larger control forces and limited lifetime for the flexbeam. Author (ESA)

N82-22259# Institut de Mecanique des Fluides de Lille (France).

APPLICATION OF KALMAN FILTERING TO THE KINEMATIC RECONSTRUCTION OF FREE FLIGHT OF CATAPULTED AIRCRAFT MODELS IN THE LABORATORY [APPLICATION DU FILTRAGE DE KALMAN A LA RESTITUTION DE LA CINEMATIQUE DES MAQUETTES D'AVION CATAPULTEES EN VOL LIBRE EN LABORATOIRE]

P. Coton 30 Jun. 1980 15 p In FRENCH
(IMFL-80-28; IMFL-8214) Avail: NTIS HC A02/MF A01

A Kalman filtering procedure was developed in order to improve results obtained with a catapult and aircraft model. Application of this procedure is criticized. It is concluded that the procedure as it stands is unreliable. Reconfiguration of the filtering system is recommended. A protocol of tests intended to determine acceptable performance of the system is presented. Author (ESA)

N82-22151# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

HELICOPTER ROTOR PERFORMANCE IMPROVEMENT BY UTILIZATION OF SWEPT-BACK PARABOLIC BLADE TIP

J. J. Philippe and P. Lafon *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-5, Sep. - Oct. 1981 (ESA-TT-725) Feb. 1982 p 55-56 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), No. 1981-5, Sep. - Oct. 1981 (For primary document see N82-22145 13-01)
Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 45

N82-22155# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Combined Environments Test Group.

DEVELOPMENT AND USE OF DYNAMIC QUALIFICATION STANDARDS FOR AIR FORCE STORES

Alan H. Burkhard and Otto F. Maurer *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 7 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

N82-22156# Cape Warwick Ltd., Warwick (England). Environmental Engineering Div.
PROBLEMS IN THE GROUND SIMULATION OF DYNAMIC RESPONSES INDUCED IN EXTERNALLY CARRIED STORES DURING FLIGHT
J. Homfray *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 24 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

N82-22158# British Aerospace Aircraft Group, Preston (England). Specialist Functions, Stress Office.
QUALIFICATION OF EQUIPMENT FOR GUNFIRE INDUCED VIBRATION
A. Peacock *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 22 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

N82-22159# General Dynamics/Fort Worth, Tex.
DYNAMIC QUALIFICATION TESTING OF F-16 EQUIPMENT
H. E. Nevius and W. J. Brignac *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 15 p (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

N82-22167# Westland Helicopters Ltd., Yeovil (England). Dynamics Dept.
THE DYNAMIC QUALIFICATION OF EQUIPMENT AND EXTERNAL STORES FOR USE WITH ROTARY WINGED AIRCRAFT
G. M. Venn *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 11 p (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

N82-22188# Service Techniques des Programmes Aeronautiques, Paris (France). Section Etudes Generalles.
A REVIEW OF RECENT AGARD SYMPOSIA ON THE ANGLE OF MANEUVERABILITY OF COMBAT AIRCRAFT [RETROSPECTIVE DE RECENTS SYMPOSIUMS AGARD SOUS L'ANGLE DE LA MANOEUVRABILITE DES AVIONS DE COMBAT]
Jean-Michel Duc (Service des Recherches/Groupe 6) and Michel Vergne *In* AGARD Combat Aircraft Maneuverability Dec. 1981 50 p refs In FRENCH (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

N82-22189# Royal Netherlands Air Force, Soesterberg.
REVIEW OF PRACTICAL EXPERIENCE ON COMBAT AIRCRAFT MANEUVERABILITY
A. W. Henni *In* AGARD Combat Aircraft Maneuverability Dec. 1981 8 p (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

N82-22190# Naval Air Systems Command, Washington, D. C.
THE MILITARY FLYING QUALITIES SPECIFICATION, A HELP OR A HINDRANCE TO GOOD FIGHTER DESIGN
Ralph C. AHarrah and Robert J. Woodcock (AFWAL, Wright-Patterson AFB, Ohio) *In* AGARD Combat Aircraft Maneuverability Dec. 1981 13 p refs (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

N82-22192# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
EXPERIMENTAL FLIGHT TEST PROGRAMS FOR IMPROVING COMBAT AIRCRAFT MANEUVERABILITY BY MANEUVER FLAPS AND PYLON SPLIT FLAPS
D. Jacob, D. Welte, and H. Wonnenberg *In* AGARD Combat Aircraft Maneuverability Dec. 1981 11 p refs (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

N82-22197# Institut de Mecanique des Fluides de Lille (France).
STATE OF THE ART AND RECENT PERSPECTIVES ON THE STUDY OF THE LOSS OF CONTROL AND SPIN [ETAT DE L'ART ET PERSPECTIVES NOUVELLES RELATIVES A L'ETUDE DE LA PERTE DE CONTROLE ET DES VRILLES]
M. G. Vanmansart and D. R. Tristrant *In* AGARD Combat Aircraft Maneuverability Dec. 1981 18 p refs In FRENCH; ENGLISH summary (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

N82-22202# Avions Marcel Dassault-Breguet Aviation, Saint-Cloud (France).
EVALUATION OF AIRCRAFT IN SIMULATED COMBAT: COMPUTER AGAINST COMPUTER OR COMPUTER AGAINST HUMAN PILOT [EVALUATION D'AVIONS EN COMBAT SIMULE CALCULATEUR CONTRE CALCULATEUR OU CALCULATEUR CONTRE PILOTE HUMAIN]
J. Pedotti and Y. Hignard (Centre Electronique de l'Armement) *In* AGARD Combat Aircraft Maneuverability Dec. 1981 14 p refs In FRENCH (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

N82-22203# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
THE ASSESSMENT OF AIRCRAFT COMBAT EFFECTIVENESS USING A NEW COMPUTATIONAL METHOD
Michael Falco and Gilbert Carpenter *In* AGARD Combat Aircraft Maneuverability Dec. 1981 11 p refs Sponsored in part by Army Aviation Research and Development Command (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

N82-22205# British Aerospace Aircraft Group, Preston (England).
THE STUDY OF COMBAT AIRCRAFT MANEUVERABILITY BY AIR TO AIR COMBAT SIMULATION
A. G. Barnes *In* AGARD Combat Aircraft Maneuverability Dec. 1981 9 p (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

N82-23140# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Military Aircraft Div.
EXPERIENCE WITH HIGH PERFORMANCE V/STOL FIGHTER PROJECTS AT MBB
Felix Aulehla and Gerhard K. Kissel *In its* Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 16 p refs Presented at AIAA/NASA Ames V/STOL Conf., Palo Alto, Calif. 7-9 Dec. 1981 (For primary document see N82-23137 13-99)
(MBB-FE-124/S/PUB/50) Avail: NTIS HC A09/MF A01

N82-23141# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Aeroelastic Branch.
APPLICATION OF A STRUCTURAL OPTIMIZATION PROCEDURE FOR ADVANCED WINGS
Heinrich Goedel and Guenter Schneider *In its* Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 15 p refs Presented at 51st AGARD Meeting on Struct. and Mater. Panel, Aix-en-Provence, France, 14-19 Sep. 1981 (For primary document see N82-23137 13-99)
(MBB-FE-171/S/PUB/49; AGARD-691) Avail: NTIS HC A09/MF A01

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N82-22260# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Helicopter Div.
CONTROLS AND DISPLAYS FOR ALL-WEATHER OPERATION OF HELICOPTERS
R. D. vonReth 3 Apr. 1981 19 p refs
(MBB-UD-319-81-O) Avail: NTIS HC A02/MF A01

Various mission requirements for all weather operations are reviewed. In particular some of the most important features for military applications are outlined. Some of the basic relations between increasing display sophistication and increasing control sophistication are discussed. Also the influence of various functions

on the degree of control automation as it seems desirable for future systems under the aspect of man machine interaction are taken into consideration. The controls and displays arrangement of some representative helicopters of presently operational helicopters are described. An outline of the goals and results of some experimental and research programs is given. The characteristics of presently operational helicopters are compared with the technologically feasible solutions taking into account some of the economic constraints as initial cost, operational cost and reliability. In an outlook at the future some basic requirements for the controls and the displays operation are established. J.M.S.

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N82-22261# British Aerospace Dynamics Group, Bristol (England).

WIND TUNNEL INVESTIGATION AND PRELIMINARY ANALYSIS OF SMALL PROPELLER PERFORMANCE

A. J. R. Hope Oct. 1980 85 p refs

(BAe-BT-10491; LR-43230) Avail: NTIS HC A05/MF A01

Fixed pitch wooden propellers were tested in a 1.5 m open working section wind tunnel. Large test repeatabilities masked any effects of propeller aging and prevented accurate limits being set for manufacturing tolerances. Computer predictions overestimated propeller thrust and power by up to 100% at design speeds, while giving a reasonable correlation at static and low speed conditions. Tested propeller efficiencies compare acceptably with predictions at all speeds, pointing to a reduction in aerodynamic incidence as the main reason for the poor high speed performance. Incidence reduction is caused by local compressibility effects altering the shape of the boundary layer over the blade surfaces. Author (ESA)

N82-22262*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THE ROLE OF MODERN CONTROL THEORY IN THE DESIGN OF CONTROLS FOR AIRCRAFT TURBINE ENGINES

J. Zeller, B. Lehtinen, and W. Merrill 1982 17 p refs Presented at 12th Aerospace Sci. Conf., Orlando, Fla., 11-14 Jan. 1982; sponsored by AIAA

(NASA-TM-82815; E-1162; NAS 1.15:82815) Avail: NTIS HC A02/MF A01 CSCL 21E

Accomplishments in applying Modern Control Theory to the design of controls for advanced aircraft turbine engines were reviewed. The results of successful research programs are discussed. Ongoing programs as well as planned or recommended future thrusts are also discussed. Author

N82-22263*# Cessna Aircraft Co., Wichita, Kans. Pawnee Div.

ADVANCED GENERAL AVIATION COMPARATIVE ENGINE/AIRFRAME INTEGRATION STUDY Final Report, Jan. 1980 - Sep. 1981

George L. Huggins and David R. Ellis Sep. 1981 133 p refs (Contract NAS3-22221)

(NASA-CR-165564; NAS 1.26:165564; Cessna-AD-217) Avail: NTIS HC A07/MF A01 CSCL 21E

The NASA Advanced Aviation Comparative Engine/Airframe Integration Study was initiated to help determine which of four promising concepts for new general aviation engines for the 1990's should be considered for further research funding. The engine concepts included rotary, diesel, spark ignition, and turboprop powerplants; a conventional state-of-the-art piston engine was used as a baseline for the comparison. Computer simulations of the performance of single and twin engine pressurized aircraft designs were used to determine how the various characteristics of each engine interacted in the design process. Comparisons were made of how each engine performed relative to the others when integrated into an airframe and required to fly a transportation mission. Author

N82-22264*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.

ENERGY EFFICIENT ENGINE EXHAUST MIXER MODEL TECHNOLOGY

H. Kozlowski and M. Larkin Jun. 1981 186 p refs (Contract NAS3-20646)

(NASA-CR-165459; NAS 1.26:165459; PWA-5594-164) Avail: NTIS HC A09/MF A01 CSCL 21E

An exhaust mixer test program was conducted to define the technology required for the Energy Efficient Engine Program. The model configurations of 1/10 scale were tested in two phases. A parametric study of mixer design options, the impact of residual low pressure turbine swirl, and integration of the mixer with the structural pylon of the nacelle were investigated. The improvement of the mixer itself was also studied. Nozzle performance characteristics were obtained along with exit profiles and oil smear photographs. The sensitivity of nozzle performance to tailpipe length, lobe number, mixer penetration, and mixer modifications like scalloping and cutbacks were established. Residual turbine swirl was found detrimental to exhaust system performance and the low pressure turbine system for Energy Efficient Engine was designed so that no swirl would enter the mixer. The impact of mixer/plug gap was also established, along with importance of scalloping, cutbacks, hoods, and plug angles on high penetration mixers. M.D.K.

N82-22265*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.

ADVANCED LOW-EMISSIONS CATALYTIC-COMBUSTOR PROGRAM, PHASE 1 Final Report

G. J. Sturgess Jun. 1981 158 p refs (Contract NAS3-20821)

(NASA-CR-159656; NAS 1.26:159656; PWA-5589-19; ESL-TR-79-23) Avail: NTIS HC A08/MF A01 CSCL 21E

Six catalytic combustor concepts were defined, analyzed, and evaluated. Major design considerations included low emissions, performance, safety, durability, installations, operations and development. On the basis of these considerations the two most promising concepts were selected. Refined analysis and preliminary design work was conducted on these two concepts. The selected concepts were required to fit within the combustor chamber dimensions of the reference engine. This is achieved by using a dump diffuser discharging into a plenum chamber between the compressor discharge and the turbine inlet, with the combustors overlaying the prediffuser and the rear of the compressor. To enhance maintainability, the outer combustor case for each concept is designed to translate forward for accessibility to the catalytic reactor, liners and high pressure turbine area. The catalytic reactor is self-contained with air-cooled canning on a resilient mounting. Both selected concepts employed integrated engine-starting approaches to raise the catalytic reactor up to operating conditions. Advanced liner schemes are used to minimize required cooling air. The two selected concepts respectively employ fuel-rich initial thermal reaction followed by rapid quench and subsequent fuel-lean catalytic reaction of carbon monoxide, and, fuel-lean thermal reaction of some fuel in a continuously operating pilot combustor with fuel-lean catalytic reaction of remaining fuel in a radially-staged main combustor. Author

N82-22266*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

STRUCTURAL DYNAMICS OF SHROUDLESS, HOLLOW FAN BLADES WITH COMPOSITE IN-LAYS

R. A. Aiello, M. S. Hirschbein, and C. C. Chamis 1982 12 p refs Presented at the 27th Ann. Intern. Gas Turbine Conf., London, 18-22 Apr. 1982; sponsored by ASME

(NASA-TM-82816; E-1163; NAS 1.15:82816) Avail: NTIS HC A02/MF A01 CSCL 21E

Structural and dynamic analyses are presented for a shroudless, hollow titanium fan blade proposed for future use in aircraft turbine engines. The blade was modeled and analyzed using the composite blade structural analysis computer program

(COBSTRAN); an integrated program consisting of mesh generators, composite mechanics codes, NASTRAN, and pre- and post-processors. Vibration and impact analyses are presented. The vibration analysis was conducted with COBSTRAN. Results show the effect of the centrifugal force field on frequencies, twist, and blade camber. Bird impact analysis was performed with the multi-mode blade impact computer program. This program uses the geometric model and modal analysis from the COBSTRAN vibration analysis to determine the gross impact response of the fan blades to bird strikes. The structural performance of this blade is also compared to a blade of similar design but with composite in-lays on the outer surface. Results show that the composite in-lays can be selected (designed) to substantially modify the mechanical performance of the shroudless, hollow fan blade. Author

N82-22267*# United Technologies Research Center, East Hartford, Conn.
INVESTIGATION OF SOOT AND CARBON FORMATION IN SMALL GAS TURBINE COMBUSTORS Final Report
T. J. Rosfjord Apr. 1982 54 p refs
(Contract NAS3-22524)
(NASA-CR-167853; NAS 1.26:167853; UTRC-R82-915387-16) Avail: NTIS HC A04/MF A01 CSCL 21E

An investigation of hardware configurations which attempt to minimize carbon and soot-production without sacrificing performance in small gas turbine combustors was conducted. Four fuel injectors, employing either airblast atomization, pressure atomization, or fuel vaporization techniques were combined with nozzle air swirlers and injector sheaths. Eight configurations were screened at sea-level takeoff and idle test conditions. Selected configurations were focused upon in an attempt to quantify the influence of combustor pressure, inlet temperature, primary zone operation, and combustor loading on soot and carbon formation. Cycle tests were also performed. It was found that smoke emission levels depended on the combustor fluid mechanics, the atomization quality of the injector and the fuel hydrogen content. R.J.F.

N82-22268*# Beech Aircraft Corp., Wichita, Kans.
ADVANCED GENERAL AVIATION ENGINE/AIRFRAME INTEGRATION STUDY
Leon A. Zmroczek Mar. 1982 131 p refs
(Contract NAS3-22220)
(NASA-CR-165565; NAS 1.26:165565) Avail: NTIS HC A07/MF A01 CSCL 21E

A comparison of the in-airframe performance and efficiency of the advanced engine concepts is presented. The results indicate that the proposed advanced engines can significantly improve the performance and economy of general aviation airplanes. The engine found to be most promising is the highly advanced version of a rotary combustion (Wankel) engine. The low weight and fuel consumption of this engine, as well as its small size, make it suited for aircraft use. T.M.

N82-22269*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE OF SINGLE-STAGE AXIAL-FLOW TRANSONIC COMPRESSOR WITH ROTOR AND STATOR ASPECT RATIOS OF 1.63 AND 1.77, RESPECTIVELY, AND WITH DESIGN PRESSURE RATIO OF 2.05
Royce D. Moore and Lonnie Reid Apr. 1982 116 p refs
(NASA-TP-2001; E-334; NAS 1.60:2001) Avail: NTIS HC A06/MF A01 CSCL 21E

The overall and blade-element performance of a transonic compressor stage is presented over the stable operating range for speeds from 50 to 100 percent of design. The stage was designed for a pressure ratio of 2.05 at a flow of 20.2 kg/sec and a tip speed of 455 m/sec. At design speed the rotor and stage achieved peak efficiencies of 0.849 and 0.831, respectively, at the minimum flow condition. The stage stall point occurred at a flow higher than the design flow. Author

N82-22270# Rolls-Royce Ltd., Derby (England).
RB211 POWERPLANT DETERIORATION: REVIEW OF CURRENT SITUATION AND LESSONS LEARNED
Alec G. Collins 1981 5 p
(PNR-90073) Avail: NTIS HC A02/MF A01

The need for high temperatures in the engine cycle of gas turbine aircraft engines was demonstrated; the effects of thermal barrier coatings (TBC) on component life, cooling air requirements, and turbine entry temperature (TET) are discussed. Experience with the RB211, Olympus 593, and Pegasus engines illustrates the usefulness of TBCs consisting of zirconia based ceramics with nickel or cobalt bond coats. Life improvements > 50% are directly attributable to TBCs on combustor walls, vaporizing fuel injectors, and discharge nozzles. Airfoil coatings survive 150 hr RB211-524 tests at higher than normal TET. Author (ESA)

N82-22271# Rolls-Royce Ltd., Derby (England).
THE CONTRIBUTION OF THERMAL BARRIER COATINGS TO IMPROVEMENTS IN THE LIFE AND PERFORMANCE OF GAS TURBINE COMPONENTS
S. J. Hartropp, D. A. Marsh, and G. W. Meetham 1981 11 p
(PNR-90076) Avail: NTIS HC A02/MF A01

Ceramic coatings significantly increase the lives of components in high temperature environments by insulating metal substrates from a hot gas stream. The need for high temperatures in gas turbine engines, and the opportunities for and requirements from thermal barrier coatings are covered. Bench and service engine evaluation and analysis of tested parts from which the features of successful coating systems were derived, are presented. Author (ESA)

N82-22272# Rolls-Royce Ltd., Derby (England).
DEVELOPMENT OF A CORRELATED FINITE ELEMENT DYNAMIC MODEL OF A COMPLETE AERO ENGINE
R. A. Bellamy, J. C. Bennett, and S. T. Elston 1981 10 p refs
(PNR-90081) Copyright. Avail: NTIS HC A02/MF A01

The accuracy of the dynamic model of the RB211 engine and nacelle was tested. Model descriptions of load/deflection behavior, natural frequencies, and mode shapes were compared with shake tests and modal analyses. Modal analysis was carried out by a frequency response analyzer which used an incremental sine technique and a minicomputer based system that input a random signal to the shaker, operating on transducer measurements with a software Fourier transform in order to achieve the frequency response functions. Correlation between the results is excellent. Author (ESA)

N82-22273# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.
PARAMETRIC STUDY OF THE INFLUENCE OF THE ENGINE UPON THE OPERATING COST OF A CIVIL HELICOPTER
Gilbert Beziac, Jean-Pierre Dedieu, and Philippe Cabrit Paris 1981 6 p Presented at 7th European Rotorcraft and Powered Lift Aircraft Forum, Garmisch-Partenkirchen, West Germany 8-11 Sep. 1981; sponsored by DFVLR, Cologne
(SNIAS-827-210-102) Avail: NTIS HC A02/MF A01

The influence of engine characteristics (weight, fuel consumption, price, power range) upon helicopter operating cost was studied. The parametric relationship between gross weight, weight of airframe with crew but without engines, engine weight, and fuel weight was defined. An 850 hp engine was made more powerful by increasing turbine inlet temperature through the cooling of the high pressure turbine and by increasing pressure ratio. Analysis shows that a sufficient power reserve is necessary, but too high a value penalizes operating cost. This confirms the interest of having a super emergency rating on civil helicopter engines. Low fuel consumption should be the result of a compromise with level of complexity since high complexity increases the engine cost and can reduce reliability. Simultaneous evolution of aircraft and engine increases cost effectiveness. Author (ESA)

N82-22274# Rolls-Royce Ltd., Derby (England).
ENCOUNTERS WITH SURGE: SOME EXPERIENCES OF DEVELOPMENT OF AXIAL COMPRESSORS FOR AERO GAS TURBINES
A. B. McKenzie Mar. 1981 35 p
(PNR-90071) Avail: NTIS HC A03/MF A01

Rolls Royce jet engine development is traced. The Avon was the first. Its design pressure ratio is 6.15, corresponding to a design temperature rise of 20 C per stage in each of 12 stages. The first stage entry diameter ratio is 0.5, lower than

contemporary compressors. In the Avon RA14, surge, precipitated when a number of stages stalled, was eliminated by progressively increasing the stagger of the last six rotor blade rows by 1 deg to 6 deg. In the Conway, a bypass provides a permanent bleed from the low pressure compressor. The bleed becomes an increasing proportion of total flow as speed is reduced. This eliminates surge problems when the engine is throttled back at high forward speed. In the Tyne, the removal of the hub section permits a higher surge pressure ratio. In the RB211, a handling bleed with a variable input is placed between the compressors. Author (ESA)

N82-22275# Rolls-Royce Ltd., Derby (England).
RELIABLE POWER
J. M. S. Keen Feb. 1981 21 p Presented at Intern. Aircraft Maintenance Eng. Exhibition and Conf., Zurich, Feb. 1981
(PNR-90078) Avail: NTIS HC A02/MF A01

The Rolls Royce RB211 engine design is reviewed. The three shaft concept increases engine thrust and cuts fuel consumption. The highest thrust version of the RB211 cuts fuel consumption of Boeing 747's by 17%. The 535E4 blends turbine and bypass flows in a buried nozzle within a longer cowl. The resultant gases are exhausted through a single final nozzle. This device provides an automatic rematching of the engine cycle at climb ratings, thereby saving fuel and reducing turbine entry temperature. Reverse thrust is increased by up to 38% relative to an unmixed engine. The on-condition maintenance policy reduces costs without reducing safety. The reliability management program ensures the most cost effective maintainance schedule. Author (ESA)

N82-22276# Rolls-Royce Ltd., Derby (England).
FUEL EFFICIENCY ENGINES FOR LARGE TRANSPORT AIRCRAFT
D. J. Parfitt 27 Mar. 1981 27 p Presented at Aeron. Soc. of India Conf., Bombay, 27 Mar. 1981
(PNR-90082; MISC-555) Avail: NTIS HC A03/MF A01

The next generation of Rolls Royce aircraft engines is discussed, especially their fuel consumption. For the RB211, improvements on the order of 15% in fuel consumption relative to the initial service standard are planned. Large fan engines are expected to remain technology leaders in the long-term. Fuel savings on the order of 10% to 15% are feasible, using low specific thrust designs. Noise and exhaust emission improvements are predicted. Advanced wing designs and the use of lightweight composite materials, linked with full authority digital control systems, enhance engine performance. Liquid hydrogen is suggested as a replacement for kerosene, because of its high heating value. Author (ESA)

N82-22277# Rolls-Royce Ltd., Derby (England).
COLLABORATIVE DEVELOPMENT OF AERO-ENGINES
G. M. Lewis 1981 9 p
(PNR-90083) Avail: NTIS HC A02/MF A01

European cooperation in aircraft engine development is described, using the Olympus and RB199 projects as examples. The management structure was based on the integration of existing teams in the partner companies. Author (ESA)

N82-22278# Rolls-Royce Ltd., Derby (England).
MULTI-MISSION V/STOL WITH VECTORED THRUST ENGINES
W. J. Lewis and P. Simpkin 1981 10 p
(PNR-90086) Avail: NTIS HC A02/MF A01

The use of V/STOL aircraft in European conflicts is discussed. Conventional aircraft were assumed to be inoperative within 370 km of the main battle area because of the destruction of runways. Achievable bomb delivery rate of subsonic V/STOL aircraft, and available combat air patrol time and the number of aircraft required in order to maintain a standing patrol of supersonic aircraft were considered. If the Harrier concept is adapted, a single vectored thrust engine with plenum chamber burning on two front nozzles, and a single rear nozzle, then the V/STOL aircraft is well suited to supersonic and subsonic air superiority and strike roles. Author (ESA)

N82-22279# Rolls-Royce Ltd., Derby (England).
DIRECTIONAL SOLIDIFICATION: PROJECT B2 Final Report
C. Lecomte-Mertens, M. Lamberigts, and D. Coutsouradis May 1981 109 p refs Transl. into ENGLISH of Rept. no. TLT-00818A, Centre de Rech. Metal. (Belgium) Partly in ENGLISH and FRENCH
(PNR-90088; Trans-15572/TLT-00818A) Avail: NTIS HC A06/MF A01

Thermal fatigue of Mar-M-002 nickel alloy blades with an equiaxial or columnar (directional) structure, precision cast in the laboratory, was evaluated. Their thermal fatigue is compared with that of nickel alloy blades obtained elsewhere. Creep resistance of the Mar-M-002 structures was tested. The influence of chemical composition, grain orientation, microstructural fineness, the presence of carbides, and morphology was determined by metallography. Crack length is always greater in blades treated at 1100 C than in those treated at 1000 C. Blade geometry is the predominant factor in thermal fatigue. Crack resistance, in ascending order is: large solid blade (laboratory); small solid blade (outside supplier); small hollow blade (industrial). The metallographic structure is not a suitable criterion for differentiating between the thermal shock behavior of equaxial blades and that of columnar blades. Author (ESA)

N82-22175# Naval Aircraft Materials Lab., Fleetlands (England).
MAINTENANCE PROBLEMS IN GAS TURBINE COMPONENTS AT THE ROYAL NAVAL AIRCRAFT YARD, FLEETLANDS
F. J. Plumb *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 13 p refs (For primary document see N82-22172 13-01)
Avail: NTIS HC A08/MF A01

N82-22176# KLM Royal Dutch Airlines, Amsterdam (Netherlands). Propulsion Systems Dept.
MAINTENANCE EXPERIENCE WITH CIVIL AERO ENGINES
J. Ph. Stroobach *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 3 p (For primary document see N82-22172 13-01)
Avail: NTIS HC A08/MF A01

N82-22177# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
ENGINE COMPONENT RETIREMENT FOR CAUSE
J. A. Harris, Jr., C. G. Annis, Jr., M. C. VanWanderham, and D. L. Sims *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 9 p refs (For primary document see N82-22172 13-01)
Avail: NTIS HC A08/MF A01

N82-22178# Rolls-Royce Ltd., Derby (England). Dept. of Materials Engineering.
DEFECTS AND THEIR EFFECT ON THE BEHAVIOR OF GAS TURBINE DISCS
Robert H. Jeal *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 15 p (For primary document see N82-22172 13-01)
Avail: NTIS HC A08/MF A01

N82-22180# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
THE INFLUENCE OF PROTECTIVE TREATMENT ON THE MECHANICAL PROPERTIES OF SUPERALLOY PARTS [INFLUENCE DES TRAITEMENTS DE PROTECTION SUR LES PROPRIETES MECANIQUES DES PIECES EN SUPERALLIAGE]
J. M. Hauser, C. Duret, and R. Pichoir *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 11 p refs In FRENCH (For primary document see N82-22172 13-01)
Avail: NTIS HC A08/MF A01

N82-22181# Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, Paris (France). Dept. Materiaux et Procedes.
TURBINE STATOR PARTS REPAIR BY DIFFUSION BRAZING
Y. Honnorat and J. Lesgourgues *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 12 p In FRENCH;

ENGLISH summary (For primary document see N82-22172 13-01)
Avail: NTIS HC A08/MF A01

N82-22185# Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).
REPAIR AND REGENERATION OF TURBINE BLADES, VANES AND DISCS
H. Huff and J. Wortmann *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 7 p refs (For primary document see N82-22172 13-01)
Avail: NTIS HC A08/MF A01

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N82-22280*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CONTROL LAW DESIGN TO MEET CONSTRAINTS USING SYNPAC-SYNTHESIS PACKAGE FOR ACTIVE CONTROLS
William M. Adams, Jr. and Sherwood H. Tiffany Jan. 1982 16 p refs Presented at the Joint Automatic Control Conf., Charlottesville, Va., 17-19 Jun. 1981
(NASA-TM-83264; NAS 1.15:83264) Avail: NTIS HC A02/MF A01 CSCL 01C

Major features of SYNPAC (Synthesis Package for Active Controls) are described. SYNPAC employs constrained optimization techniques which allow explicit inclusion of design criteria (constraints) in the control law design process. Interrelationships are indicated between this constrained optimization approach, classical and linear quadratic Gaussian design techniques. Results are presented that were obtained by applying SYNPAC to the design of a combined stability augmentation/gust load alleviation control law for the DAST ARW-2. Author

N82-22281*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AN ANALYSIS OF A NONLINEAR INSTABILITY IN THE IMPLEMENTATION OF A VTOL CONTROL SYSTEM
Jeanine M. Weber Mar. 1982 65 p refs
(NASA-TM-84220; A-8840; NAS 1.15:84220) Avail: NTIS HC A04/MF A01 CSCL 01C

The contributions to nonlinear behavior and unstable response of the model following yaw control system of a VTOL aircraft during hover were determined. The system was designed as a state rate feedback implicit model follower that provided yaw rate command/heading hold capability and used combined full authority parallel and limited authority series servo actuators to generate an input to the yaw reaction control system of the aircraft. Both linear and nonlinear system models, as well as describing function linearization techniques were used to determine the influence on the control system instability of input magnitude and bandwidth, series servo authority, and system bandwidth. Results of the analysis describe stability boundaries as a function of these system design characteristics. A.R.H.

N82-22282# National Aerospace Lab., Tokyo (Japan).
EXPERIMENT ON ACTIVE FLUTTER SUPPRESSION OF A CANTILEVER WING
Takao Kikuchi and Hae Kyong Lee Dec. 1981 10 p refs In JAPANESE; ENGLISH summary
(NAL-TR-690; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

An experiment on active flutter suppression of a cantilever wing with the control surface at the wing tip is described. The experiment was done in a low subsonic wind tunnel. The deflection of the wing was measured by strain gages located near the root of the wing. The aileron was driven by a servomotor. Comparison was made between the present and previous results. It is concluded that the coefficients of the control law may have a different effect on the stability of the two- and three-dimensional models. Author

N82-22160# McDonnell-Douglas Corp., St. Louis, Mo. Structural Dynamics Sect.
DEVELOPMENT OF VIBRATION QUALIFICATION TEST SPECTRA FOR THE F-15 AIRCRAFT
G. R. Waymon *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 19 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

N82-22161# British Aerospace Aircraft Group, Kingston-upon-Thames (England).
EQUIPMENT VIBRATION QUALIFICATION FOR HARRIER AND HAWK AIRCRAFT
D. C. Thorby *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 7 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

N82-22163# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Aircraft Div.
VIBRATION QUALIFICATION OF EXTERNAL A/C STORES AND EQUIPMENT
M. Steininger and G. Haidl *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 14 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

N82-22165# Army Aviation Research and Development Command, St. Louis, Mo. Structures and Aeromechanics Div.
THE STRUCTURAL DYNAMIC INTERFACE REQUIRED FOR DEVELOPING HELICOPTER TARGET ACQUISITION SYSTEMS
Sam T. Crews *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 9 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

N82-22166# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
APPROACH IN DYNAMIC QUALIFICATION OF LIGHT HELICOPTER STORES AND EQUIPMENTS
D. Braun and J. Stoppel *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 8 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

N82-22168# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. of Aeroelasticity.
APPLICATION OF MODAL SYNTHESIS TECHNIQUES FOR THE DYNAMIC QUALIFICATION OF WINGS WITH STORES
E. Breitbach *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 22 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

N82-22169# Boeing Military Airplane Development, Seattle, Wash. Structural Dynamics Dept.
STOL AIRCRAFT STRUCTURAL VIBRATION PREDICTION FROM ACOUSTIC EXCITATION
B. F. Dotson and J. Pearson (AFWAL) *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 20 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

N82-22171# Grumman Aerospace Corp., Bethpage, N.Y.
DEVELOPMENT OF A TAPED RANDOM VIBRATION TECHNIQUE FOR ACCEPTANCE TESTING
John Devitt, Richard Pokallus, Joseph Popolo, and Eugene Baird *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 6 p (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

N82-22191# Systems Technology, Inc., Hawthorne, Calif.
DEVELOPMENT OF A TENTATIVE FLYING QUALITIES CRITERION FOR AIRCRAFT WITH INDEPENDENT CONTROL OF SIX DEGREES OF FREEDOM: ANALYSIS AND FLIGHT TEST

Roger H. Hoh, Thomas T. Myers, and Irving L. Ashkenes *In* AGARD Combat Aircraft Maneuverability Dec. 1981 12 p refs (For primary document see N82-22187 13-01)
(Contract F33615-78-C-3616)
Avail: NTIS HC A11/MF A01

N82-22193*# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
MULTIVARIABLE CLOSED LOOP CONTROL ANALYSIS AND SYNTHESIS FOR COMPLEX FLIGHT SYSTEMS
David K. Schmidt *In* AGARD Combat Aircraft Maneuverability Dec. 1981 13 p refs (For primary document see N82-22187 13-01)
(Grants NAG4-1; AF-AFOSR-0042-72)
Avail: NTIS HC A11/MF A01

N82-22195# Royal Aircraft Establishment, Farnborough (England). Flight Systems Dept.
ENHANCED PILOTING CONTROL THROUGH COCKPIT FACILITIES AND A.C.T.
D. J. Walker (British Aerospace P.L.C., Brough, U.K.) and P. W. J. Fullam *In* AGARD Combat Aircraft Maneuverability Dec. 1981 6 p refs (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

N82-22198# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
APPLICATION OF THE THEORY OF BIFURCATIONS TO THE STUDY OF THE LOSS OF CONTROL IN COMBAT AIRCRAFT [APPLICATION DE LA THEORIE DS BIFURCATIONS A L'ETUDE DES PERTES DE CONTROLE SUR AVION DE COMBAT]
Phillipe Guicheteau *In* AGARD Combat Aircraft Maneuverability Dec. 1981 13 p refs In FRENCH (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

N82-22200# British Aerospace Aircraft Group, Preston (England). Aerodynamics Dept.
AEROELASTIC TAILORING FOR CONTROL AND PERFORMANCE: ARE REQUIREMENTS COMPATIBLE?
D. Booker *In* AGARD Combat Aircraft Maneuverability Dec. 1981 4 p refs (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

N82-22201# Northrop Corp., Hawthorne, Calif. Aircraft Div.
TAIL CONFIGURATIONS FOR HIGHLY MANEUVERABLE COMBAT AIRCRAFT
W. E. Fellers, W. S. Bowman, and P. T. Wooler *In* AGARD Combat Aircraft Maneuverability Dec. 1981 18 p (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

N82-22204# McDonnell-Douglas Corp., St. Louis, Mo. Operations Analysis Dept.
EVALUATION OF DIRECT FORCE MODE FIGHTERS BY COMBAT SIMULATION
C. H. Guthrie *In* AGARD Combat Aircraft Maneuverability Dec. 1981 13 p (For primary document see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N82-22283*# Aerojet Electrosystems Co., Azusa, Calif.
MULTIPLEXED EXTRINSIC SILICON DETECTOR ARRAY Final Report
James F. Yee Mar. 1982 48 p
(Contract NAS2-10643)
(NASA-CR-166323; NAS 1.26:166323) Avail: NTIS HC A03/MF A01 CSCL 03A

Multiplexed extrinsic silicon detector arrays for infrared applications were developed and tested. Cryogenic electronics are discussed. Ambient temperature electronics are also discussed. N.W.

N82-22284*# National Aeronautics and Space Administration, Washington, D. C.
STUDIES ON WIND TUNNEL STRAIGHTENERS
F. Schultz-Grunow and K. Wieghardt Mar. 1982 16 p refs Transl. into ENGLISH from Luftfahrtforschung (West Germany), v. 17, no. 3, 20 Mar. 1940 p 82-86 Transl. by Kanner (Leo) Associates, Redwood City, Calif. original doc. prep. by Kaiser-Wilhelm Inst. for Flow Research, Goettingen (West Germany)
(Contract NASw-3541)
(NASA-TM-76689; NAS 1.15:76689) Avail: NTIS HC A02/MF A01 CSCL 14B

Tests using small-scale straighteners are reported. The studies allowed conclusions on the most favorable depth relationships, flow conditions behind the straightener and on the drag. The ways an obliquely hitting airflow is deflected by a straightener are examined. In addition the flow drag was measured and the manner in which the individual air columns emanating from the holes unite to form a homogeneous speed field was investigated. N.W.

N82-22285# National Inst. for Aeronautics and Systems Technology, Pretoria (South Africa).
DESIGN OF DYNAMICALLY-SCALED, ASYMMETRICAL WIND TUNNEL MODELS
M. E. Beyers 6 Aug. 1981 18 p refs
(NIAST-78/18) Avail: NTIS HC A02/MF A01

Dynamically scaled models are used in aerodynamic studies, notably in aircraft/store or stage separation studies. Techniques were developed for the design of free flight models in three general categories: dynamic stability free flight models, high maneuverability models optimized for nonoscillatory motion studies, and dynamic separation models. Dynamic scaling with fully simulated mass asymmetries play an important part in each of the three categories, particularly when nonplanar motions are simulated. The method is implemented in a 'FORTRAN IV DSAM'. S.L.

N82-22286# Research Inst. of National Defence, Umea (Sweden). Huvudavdelning 4.
RADIAK SIMULATOR FOR AIRCRAFT INSTRUMENTS [RADIAKSIMULATOR FOER FLYGINDIKERING]
Goeran Hulten, Melker Nordstrand, and Thomas Ulvsand Jun. 1981 30 p ref In SWEDISH
(FOA-C-40136-A3) Avail: NTIS HC A03/MF A01

An intensimeter no. 23 was used to detect radiation from aircraft. A simulator which could be programmed to give different time controlled simulated lapses was added to the equipment. The missions programmed into the memory included indications along a road, over an area and spot indications. Testing was performed at the Army Helicopter school in Boden under realistic conditions. Results indicate that this type of simulation is useful in training aircraft indication personnel. M.D.K.

N82-22152# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
REAL TIME DIGITAL FILTERING TEST IN THE S1 CONTINUOUS WIND TUNNEL AT MODANE
J. Appel *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-5, Sep. - Oct. 1981 (ESA-TT-725) Feb. 1982 p 57-61 ref Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), No. 1981-5, Sep. - Oct. 1981 (For primary document see N82-22145 13-01)
Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 45

N82-22196*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE DEVELOPMENT OF CRYOGENIC WIND TUNNELS AND THEIR APPLICATION TO MANEUVERING AIRCRAFT TECHNOLOGY
E. C. Polhamus and R. F. Boyden *In* AGARD Combat Aircraft Maneuverability Dec. 1981 12 p refs (For primary document

see N82-22187 13-01)
Avail: NTIS HC A11/MF A01

N82-22977# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
DEFNINITION OF THE CONVERGENCE AND PICKUP SECTIONS OF THE CEPRA 19 ANECHOIC WIND TUNNEL FROM TESTS ON AN 8:100 SCALE MODEL [DEFINITION DU CONVERGENT ET DE LA REPRISE DE LA SOUFFLERIE ANECHOIQUE CEPRA 19 A PARTIR D'ESSAIS SUR UNE MAQUETTE AU 8/100]
P. Rebuffet and A. Guedel *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 4 p refs In FRENCH (For primary document see N82-22957 13-71)
Avail: NTIS HC A08/MF A01

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N82-22287*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MATERIALS PROCESSING IN SPACE BIBLIOGRAPHY
Elizabeth Pentecost, comp. 15 Mar. 1982 188 p
(NASA-TM-82466; NAS 1.15:82466) Avail: NTIS HC A09/MF A01 CSCL 22A

Literature dealing with flight experiments utilizing a low gravity environment to elucidate and control various processes or with ground based activities that provide supporting research is listed. Included are Government reports, contractor reports, conference proceedings, and journal articles. Subdivisions of the bibliography include the five categories: crystal growth; metals, alloys, and composites, fluids and transport; glasses and ceramics; and Ultrahigh Vacuum and Containerless Processing Technologies, in addition to a list of patents and a compilation of anonymously authored collections and reports and a cross reference index.
T.M.

N82-22288# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Hochfrequenztechnik.
OUTLINE, EXPERIMENTAL PROPOSALS, AND DESCRIPTION OF A PLANNED 20/30 GHz SATELLITE EXPERIMENT
Arno Schrott Jun. 1981 190 p refs In GERMAN; ENGLISH summary
(DFVLR-Mitt-81-11) Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 39,50

Experiments into the feasibility of using the 20 to 30 GHz band for telecommunication and satellite transmission are proposed. The activities of other countries or organizations, ESA and INTELSAT, are reviewed. The influence of the atmosphere on the propagation characteristics of microwaves in the 20 to 30 GHz band is described and methods for estabilishing these effects are indicated. A preexperiment for testing and optimizing equipment and data processing, as well as training personnel, is outlined. The satellite experimental system, the ground station and the planned propagation experiments are described.
Author (ESA)

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N82-22289 Virginia Polytechnic Inst. and State Univ., Blacksburg.
FIXED-TRIM REENTRY GUIDANCE ANALYSIS Ph.D. Thesis
Christopher Gracey 1981 135 p
Avail: Univ. Microfilms Order No. 8126259

The terminal guidance problem for a fixed-trim reentry body is formulated with the objective of synthesizing a closed-loop steering law. A transformation of variables is made that reduces the order of the state system for the guidance problem, and a subsequent linearization with motion along the sight line to the target as a reference produces a further order reduction. The final, reduced order system, although nonliner and time varying, is simple enough to lend itself to synthesis of a class of guidance laws. A generalization of the feed-forward device of classical control theory is successfully employed for compensation of roll-autopilot lags. A comparison with existing fixed-trim guidance laws is carried out computationally with a simulation model idealizing the navigation and control system as error-free. The proposed guidance law exhibits superior mis-distance performance in the comparison. Dissert. Abstr.

N82-22290*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ON-ORBIT FREE MOLECULAR FLOW AERODYNAMIC CHARACTERISTICS OF A PROPOSAL SPACE OPERATIONS CENTER CONFIGURATION
Paul O. Romere Mar. 1982 162 p
(NASA-TM-58243; NAS 1.15:58243) Avail: NTIS HC A08/MF A01 CSCL 22B

A proposed configuration for a Space Operations Center is presented in its eight stages of buildup. The on orbit aerodynamic force and moment characteristics were calculated for each stage based upon free molecular flow theory. Calculation of the aerodynamic characteristics was accomplished through the use of an orbital aerodynamic computer program, and the computation method is described with respect to the free molecular theory used. The aerodynamic characteristics are presented in tabulated form for each buildup stage at angles of attack from 0 to 360 degrees and roll angles from -60 to +60 degrees. The reference altitude is 490 kilometers, however, the data should be applicable for altitudes below 490 kilometers down to approximately 185 kilometers. Author

N82-22291# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmensbereich Raumfahrt.
STUDY OF A THREE AXIS STABILIZED MODE OF OPERATION IN TRANSFER ORBIT: PHASE 1 Final Report
K. Schneider, W. Goeschel, E. Bruederle, H. Herbst, G. Kulterer, Ch. Roche, and M. Chognot (SNIAS, Cannes, France) 1978 240 p
(Contract ESA-3382/77-NL-SW)
(MBB-RX-33/A/5748; ESA-CR(P)-1225) Avail: NTIS HC A11/MF A01

A general study of the three axis stabilized mode of operation in transfer orbit leading to three possible technical solutions for an ARIANE class communications satellite is presented. These solutions are elaborated and compared in a trade off. In two situations, and adaptation to the existing PHEBUS-X design is possible with minor modifications. With relatively simple modifications of the regulators used in geostationary orbit, full and stable three axis control of the satellite during apogee injection can be achieved. Author (ESA)

N82-22292# Royal Aircraft Establishment, Farnborough (England).
A REVIEW OF FUTURE ORBIT TRANSFER TECHNOLOGY
D. G. Fearn 30 Jun. 1981 65 p refs Presented at Symp. on Space Transportation Systems for the 1990's: Requirements and Solutions, London, 15 Apr. 1981
(RAE-TR-81080; RAE-Space-599; BR81558) Avail: NTIS HC A04/MF A01

Cargo and crew transfer to outer orbits for space industrialization projects is discussed. Chemical, electric, resistojet, nuclear, and high thrust ion propulsion systems are reviewed. Chemical propulsion systems are needed for personnel transfer, but the high specific impulse offered by electric propulsion provides an enormous economic advantage for the movement of nonpriority cargo. Propellant mass required to transport a payload to geostationary Earth orbit can be reduced to < 0.1 kg/kg. Kaufman ion thrusters are best suited. Author (ESA)

N82-22293# Royal Aircraft Establishment, Farnborough (England).

ANALYSIS OF THE ORBIT OF 1966-63A NEAR 15TH ORDER RESONANCE
Doreen M. C. Walker and A. N. Winterbottom 28 Sep. 1981 18 p refs
(RAE-TR-81113; RAE-Space-605; BR81547) Avail: NTIS HC A02/MF A01

The orbit of a spherical skeleton (mass 10.4 kg diameter 9.14 m) was determined at 32 epochs between Oct. 1976 and Apr. 1977, using an orbit refinement program and 1500 observations. The orbit passed through exact 15th order resonance on 8 Dec. 1976. The 32 values of inclination were analyzed in order to obtain lumped 15th order geopotential coefficients, i.e. 36.900 + or - 9700 and 12.200 + or - 4700. When these values were used (with 22 other pairs of values) to solve for individual harmonic coefficients, there was a definite improvement over any previous solution. It is not possible to successfully analyze eccentricity values since solar radiation pressure effects were too great and the actual change due to resonance was very small. Author (ESA)

N82-23118*# Houston Univ., Tex. Mission Planning and Analysis Div.
NONLINEAR COUPLING BETWEEN THE IN-PLANE AND OUT-OF-PLANE MOTION ABOUT A STATIONARY POINT IN GEOSYNCHRONOUS ORBIT
Bruce R. Feiring *In its* The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 18 p refs (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 22A

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N82-22294*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
SATELLITE-TRACKING AND EARTH DYNAMICS RESEARCH PROGRAMS Semiannual Progress Report, 1 Jul. - 31 Dec. 1981
Apr. 1982 99 p ref
(Grant NGR-09-015-002)
(NASA-CR-168836; NAS 1.26:168836; SPR-45) Avail: NTIS HC A05/MF A01 CSCL 22A

The activities carried out by the Smithsonian Astrophysical Observatory (SAO) are described. The SAO network continued to track LAGEOS at highest priority for polar motion and Earth rotation studies, and for other geophysical investigations, including crustal dynamics, Earth and ocean tides, and the general development of precision orbit determination. The network performed regular tracking of several other retroreflector satellites including GEOS-1, GEOS-3, BE-C, and Starlette for refined determinations of station coordinates and the Earth's gravity field and for studies of solid Earth dynamics. A major program in laser upgrading continued to improve ranging accuracy and data yield. This program includes an increase in pulse repetition rate from 8 ppm to 30 ppm, a reduction in laser pulse width from 6 nsec to 2 to 3 nsec, improvements in the photoreceiver and the electronics to improve daylight ranging, and an analog pulse detection system to improve range noise and accuracy. Data processing hardware and software are discussed. R.J.F.

N82-22295* National Aeronautics and Space Administration, Washington, D. C.
INTELSAT SATELLITE SCHEDULED FOR LAUNCH
26 Feb. 1982 8 p
(NASA-News-Release-82-30; P82-10030) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 22A

The launch schedule for INTELSAT V-D, the fourth of a series of nine international telecommunications satellites, is presented. Satellite and launch vehicle specifications are presented. N.W.

N82-22296# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
TRANSPORTATION SYSTEMS AND COST COMPARISON FOR LAUNCHING AN SPS INTO GEOSYNCHRONOUS ORBIT
D. E. Koelle 1981 13 p refs Presented at 28th Conv. Intern. Sci. Sullo Spazio, Rome, 25-26 Mar. 1981
(MBB-UR-488-81-O) Avail: NTIS HC A02/MF A01

The alternatives studied for the task of launching a series of space power stations (SPS) into geosynchronous orbit are described. The U.S. scheme with a winged manned system plus electric propulsion for orbit transfer is compared to ballistic system concepts studied in Europe. Transportation cost and development costs are outlined for the three cases. M.S.

N82-22297# European Space Agency, Paris (France).
SIRIO 2 FLIGHT READINESS REVIEW
26 Nov. 1981 98 p Meeting held 26 Nov. 1981
Avail: NTIS HC A05/MF A01

The SIRIO 2 flight model status, launch and orbital phase ground segment, and launch vehicle, composite and range facilities interfaces are reviewed. The satellite design is flight qualified and the flight model is acceptable. System level requirements are met. Nonconformances, deviations, and waivers are adequately dealt with. A set of spares is available, as is launch support equipment. Plans and procedures for the launch campaign are provided. Author (ESA)

N82-22298# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
THE ECS/MARECS SPACECRAFT DESIGN AND PROGRAMME STATUS
R. G. Staniforth and T. A. Stone 1980 19 p
Avail: NTIS HC A02/MF A01

The ECS and MARECS satellites are discussed. Both satellites are based on OTS concepts. A service module provides power, attitude control, and telemetry tracking and command. It is built around a central thrust cone which houses an apogee boost motor. A horizontal equipment platform carries the service units. The satellites are three axis stabilized, using information from IR Earth sensors to control a one degree of freedom system with two fixed momentum wheels and one transverse momentum wheel. East/west stationkeeping, is achieved by hydrazine thrusters. The power required for MARECS is 760 W dc, for ECS 915 W dc. Two MARECS spacecraft are destined for a global maritime communications network. Passive intermodulation is a problem with MARECS. Polarization problemable occur with ECS front fed elliptical antennas. Author (ESA)

N82-23138# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Dept. of Aerodynamics.
AERODYNAMIC CHARACTERISTICS OF BODIES WITH RECTANGULAR CROSS SECTION
Hans G. Knoche, Werner Schamel, Helmut Esch (DFVLR, Cologne), and Wolfgang Schneider (DFVLR, Cologne) *In its* Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 11 p refs Presented at 19th AIAA Aerospace Sci. Meeting, St. Louis, Mo., 12-12 Jan. 1981 Sponsored by West German Ministry of Defense (For primary document see N82-23137 13-99)
(MBB-UA-570-81-OE) Avail: NTIS HC A09/MF A01

N82-23144# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
A MODULAR GEOPLATFORM CONCEPT FOR INTELSAT 7 AND OTHER APPLICATIONS
Dietrich E. Koelle and Wolfgang Kleinau *In its* Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 11 p refs Presented at DGLR Symp. on Nachrichtensatelliten-heute u. Morgen, Munich, 15 Oct. 1981 (For primary document see N82-23137 13-99)
(MBB-UR-517-81-OE) Avail: NTIS HC A09/MF A01

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

N82-22299* National Aeronautics and Space Administration, Washington, D. C.
SPACE SHUTTLE PAYLOAD FLIGHT MANIFEST
14 Apr. 1982 15 p
(NASA-News-Release-82-46) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 22A

Data are presented covering (1) scheduled launch month and orbiter vehicle, (2) the inclination of the orbit and the altitude in nautical miles, (3) the number of crew members and the duration of the mission, (4) the payload, and (5) the carrier.
N.W.

N82-22300*# Engineering Analysis, Inc., Huntsville, Ala.
ADVANCED SPACE SHUTTLE SIMULATION MODEL Interim Report
Frank B. Tatom and S. Ray Smith Washington NASA Apr. 1982 109 p refs
(Contract NAS8-33818)
(NASA-CR-3541; M-377; NAS 1.26:3541) Avail: NTIS HC A05/MF A01 CSCL 22B

The effects of atmospheric turbulence in horizontal and near-horizontal flight during the return of the Space Shuttle are important for determining design, control, and pilot-in-the-loop effects. A nonrecursive model (based on vonKarman spectra) for atmospheric turbulence along the flight path of the Shuttle Orbiter has been developed which provides for simulation of instantaneous vertical and horizontal gusts at the vehicle center-of-gravity and also for simulation of instantaneous gust gradients. Based on this model the time series for gusts and gust gradients have been generated and stored on a series of magnetic tapes which are entitled Shuttle Simulation Turbulence Tapes (SSTT). The time series are designed to represent atmospheric turbulence from ground level to an altitude of 120,000 meters. A description of the turbulence generation procedure is provided, the results of validating the simulated turbulence are described, and conclusions and recommendations are presented. Appendices provide tabulated one-dimensional vonKarman spectra, a discussion of the minimum frequency simulated, and the results of spectral and statistical analyses of the SSTT. Author

N82-22301# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
FUTURE LOW-COST SPACE TRANSPORTATION SYSTEM ANALYSIS
Dietrich E. Dietrich and Hermann H. Koelle 1981 36 p refs Reprint of Astronautical Acta, v. 6, 1979 p 1635-1667
(MBB-UR-486-0) Avail: NTIS HC A03/MF A01

Present technological trends for space transportation systems are analyzed to determine likely candidate vehicles. The methods selected for the analysis include: (1) a calculation procedure to derive vehicle performance and mass characteristics; (2) a procedure to determine vehicle cost; and (3) a procedure to determine all operational parameters which might have an influence on the selection of vehicle type or size. The standard mission for the vehicles under consideration are the transportation of heavy cargo into geosynchronous Earth orbit (GEO). The total number of variables considered is in the order of 30. A computer based system model is required to carry out the parameter variations and to allow a detailed sensitivity and error analysis. The structures of the submodels and the total model are described in the form of flow diagrams in some detail. J.M.S.

N82-23111*# Houston Univ., Clear Lake, Tex.
INTERNATIONAL AEROSPACE ENGINEERING: NASA SHUTTLE AND EUROPEAN SPACELAB
Roger E. Bilstein *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 26 p refs (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 22B

N82-23128*# Murray State Univ., Ky.
A SPECTROSCOPIC EXPERIMENTAL AND COMPUTER-ASSISTED EMPIRICAL MODEL FOR THE PRODUCTION AND ENERGETICS OF EXCITED OXYGEN MOLECULES FORMED BY ATOM RECOMBINATION ON SHUTTLE TILE SURFACES Final Report
David Allan Owan *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 53 p refs (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 22B

N82-23145# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany). Fluid Dynamics Dept.
OBJECTIVES OF AND APPROACH TO SPACELAB THERMAL SYSTEM TEST PERFORMED WITH THE ENGINEERING MODEL
Helmut Loeser *In* MBB Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 16p refs Presented at Intersoc. Conf. on Environ. Systems, San Francisco, 13-15 Jul. 1981 (For primary document see N82-23137 13-99)
(ASME-Bereich81-ENAS-17) Avail: NTIS HC A09/MF A01

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N82-22302# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
CONCATENATED CODING ON A SPACECRAFT TO GROUND TELEMETRY CHANNEL: PERFORMANCE
H. F. A. Roefs and M. R. Best 1 Apr. 1981 8 p refs Presented at Intern. Conf. of Commun., Denver, 14-18 Jun. 1981
(NLR-MP-80044-U) Avail: NTIS HC A02/MF A01

A concatenated coding scheme consisting of a rate 1/2 convolutional inner code and a Reed-Solomon (RS) outer code was assessed for ESA requirement of an extra coding gain of at least 2 db at a 10 to the minus 4 error rate. The RS parameters were defined and the burst error patterns of the rate 1/2 convolutional inner decoder were examined theoretically. A coding gain over uncoded binary phase shift keying of 7.2 db can be achieved within the error rate with a (256.224)RS outer code over GF(257) when error decoding only is used. With errors and erasures decoding, the gain can be 0.2 db higher.
Author (ESA)

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N82-22303*# Bendix Corp., Teterboro, N. J. Guidance Systems Div.

MODULAR DESIGN ATTITUDE CONTROL SYSTEM Final Report
F. D. Chichester 8 Mar. 1982 137 p refs
(Contract NAS8-33979)
(NASA-CR-161998; NAS 1.26:161998) Avail: NTIS HC A07/MF A01 CSCL 22B

A hybrid multilevel linear quadratic regulator (ML-LQR) approach was developed and applied to the attitude control of models of the rotational dynamics of a prototype flexible spacecraft and of a typical space platform. Three axis rigid body flexible suspension models were developed for both the spacecraft and the space platform utilizing augmented body methods. Models of the spacecraft with hybrid ML-LQR attitude control and with LQR attitude control were simulated and their response with the two different types of control were compared. S.L.

N82-22304*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PRELIMINARY ANALYSIS OF STS-2 ENTRY FLIGHT DATA
Apr. 1982 155 p
(NASA-TM-81371; NAS 1.15:81371) Avail: NTIS HC A08/MF A01 CSCL 22B

A preliminary analysis of the data obtained during the entry of the STS-2 flight was completed. The stability and control derivatives from STS-2 were examined. Questions still remain throughout the flight envelope and the area below Mach 3 needs more study. With three controls operating in a high gain feedback system, it is difficult to separate the individual effects of each of the controls. Analysis of the aerothermal data shows that wing structural-temperature measurements are generally repeatable and consistent with the trajectories. The measured wing upper surface temperatures are in reasonable agreement with Dryden predictions but wing lower surface temperatures are higher than Dryden predictions. Heating and heat transfer models will be adjusted to improve the temperature prediction capability for future trajectories. E.A.K.

N82-22305# Engins Matra, Velizy (France).
AN INTEGRATED APPROACH TO SPACECRAFT PERFORMANCE MEASUREMENTS
J. M. Fourquet May 1980 121 p refs
(T-NT-30000-6645-MT-Issue-00-E) Avail: NTIS HC A06/MF A01

An integrated analysis of spacecraft performance measurement is outlined with emphasis on cost effectiveness. Spacecraft test requirements must be considered right from the very beginning of a development program. Consequently, the overall efficiency of the test operations depends on a gradual buildup from the very early definition and development phases. With this philosophy of spacecraft testing, dissimilar tasks grouped under the general category of ground testing are surveyed. Methodology and implementation examples, requiring management decisions early in the program schedule, serve to quantify possible trade offs. This leads to a more objective assessment of required system and orbital performances, predicted with a maximum of confidence. Author (ESA)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

N82-22306# Selenia S.p.A., Rome (Italy). Space Activities Div.
RADAR ALTIMETER PHASE A STUDY Final Report
Paris ESA Apr. 1981 317 p refs
(Contract ESA-4428/80/F-DD(SC))
(TN-0120; ESA-CR(P)-1514) Avail: NTIS HC A14/MF A01

A 13.4 to 14 GHz altimeter, for determining average ocean profile, significant wave height, and wind speed, is described. A full deramp concept was chosen. The echo RF signal is mixed with a replica of the transmitted signal, suitably time delayed, in order to align it with the chirped echo from the mean ocean level. The IF bandwidth is dimensioned according to the maximum expected wave height. The signal processing unit (digital) consists of a multiplier-accumulator and a microprocessor which performs quasi-real time and differed time operations. A digital precision delay generator manages the unit. The IF signal is converted into a video signal. Video signals are converted into 5 bit digital words. System reliability is assured by full redundancy. Author (ESA)

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N82-22307*# United Technologies Research Center, East Hartford, Conn.
BOOSTER SEPARATION MOTOR Final Report
14 Aug. 1981 39 p
(Contract NAS8-31672)
(NASA-CR-162000; NAS 1.26:162000; CSD-5180-81-1) Avail: NTIS HC A03/MF A01 CSCL 21H

The design, development, fabrication, testing, evaluation and flight qualification of the space shuttle booster separation motor is discussed. Delivery of flight hardware to support the research and development flights of the space shuttle is discussed. R.J.F.

N82-22308*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ELECTRODE PROCESSES IN MPD THRUSTERS
K. Harstad 1 Mar. 1982 33 p refs
(Contract NAS7-100)
(NASA-CR-168816; JPL-Pub-81-114; NAS 1.26:168816) Avail: NTIS HC A03/MF A01 CSCL 21C

As a preliminary step in understanding and controlling electrode erosion in a magnetoplasmadynamic arc-jet, a literature survey on electrode processes in high current discharges was conducted and the findings are reported. The cathode erosion rate is delimited and the formation of anode spots, which produce large erosion, is discussed. Needed experimental measurements are suggested. M.G.

N82-22309*# Aerojet Liquid Rocket Co., Sacramento, Calif.
LOW-THRUST Isp SENSITIVITY STUDY Final Report
L. Schoenman 12 Apr. 1982 265 p refs
(Contract NAS3-22665)
(NASA-CR-165621; NAS 1.26:165621) Avail: NTIS HC A12/MF A01 CSCL 21H

A comparison of the cooling requirements and attainable specific impulse performance of engines in the 445 to 4448N thrust class utilizing LOX/RP-1, LOX/Hydrogen and LOX/Methane propellants is presented. The unique design requirements for the regenerative cooling of low-thrust engines operating at high pressures (up to 6894 kPa) were explored analytically by comparing single cooling with the fuel and the oxidizer, and dual cooling with both the fuel and the oxidizer. The effects of coolant channel geometry, chamber length, and contraction ratio on the ability to provide proper cooling were evaluated, as was the resulting specific impulse. The results show that larger contraction ratios and smaller channels are highly desirable for certain propellant combinations. T.M.

N82-22310# National Aerospace Lab., Tokyo (Japan).
HIGH FREQUENCY INSTABILITY IN A LOX-KEROSENE ROCKET COMBUSTOR. EFFECTS ON HEAT TRANSFER AUGMENTATION
Yoshio Wakamatsu, Hiroshi Tamura, Akio Suzuki, Fumiei Ono, and Mitsuo Toyokawa Oct. 1981 37 p refs In JAPANESE; ENGLISH summary
(NAL-TR-684; ISSN-0389-4010) Avail: NTIS

HC A03/MF A01

The high frequency instability of a JP-4 fuel and liquid oxygen rocket combustor, especially the effects of this instability on heat transfer augmentation to the chamber wall, was studied. The FOF triplet type injector element and two chambers with different lengths were used in the experiments. Both chambers delivered a 10kN thrust at a 3.5 MPa chamber pressure. The pressure oscillation generated spontaneously was identified as being a longitudinal first mode. The ratio of rms pressure amplitude to average chamber pressure observed in unstable combustion was 0.23 at most. In order to obtain stable combustion or weak unstable combustion, a damping device based on Crocco's theory of longitudinal high frequency instability was designed and used successfully. The heat flux to the wall increased six to seven times at most due to the instability. It was shown that the increase of the bulk heat transfer coefficient was proportional to the square root of rms pressure amplitude when the effective temperature, based on the frequency of oscillation, was used. The time average static pressure along the chamber axis increased downstream after it had first decreased. Theoretical analysis of the periodically oscillating one-dimensional flow showed reasonable agreement with the experimental results. M.G.

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N82-22311# National Physical Lab., Teddington (England). Div. of Chemical Standards.

RESEARCH ON REFERENCE METHODS AND REFERENCE MATERIALS, 1974 - 1980

J. D. Cox Mar. 1981 62 p refs

(NPL-Chem-117; ISSN-0143-7003) Avail: NTIS HC A04/MF A01

The establishment of certified reference materials (CRM) which improve the traceability of chemical measurements to NPL and the national measurement system is discussed. Measurement of thermal properties, particle properties, polymer molar mass, and chemical composition is considered. Improvements/developments in measurement techniques needed to render them reference methods are treated. The preparation and certifying of CRM's is outlined. The CRM's already in use, or being tested, are assessed. They provide swift, economic traceability, since direct connection between NPL and user laboratories eliminates the need for intermediaries required by a calibration chain using instruments. Author (ESA)

N82-22312# Research Inst. of National Defence, Umea (Sweden).

MEASUREMENTS OF THE CONDUCTIVITY AND MASS MODIFICATIONS IN OXIMES EXPOSED TO A CHOLINESTERASE BLOCKING INSECTICIDE. AN INVESTIGATION OF POSSIBLE USE IN THE DETECTION OF C-WEAPON SYSTEMS [MAETNINGAR AV KONDUKTIVITETS- OCH MASSFOERAEANDRINGAR HOS NAAGRA OXIMER VID EXPONERING FOER IN KOLINESTERASHAEMMANDE INSEKTICID. EN UNDERSOEKNING AV ANVAENBARHET FOER INDIKERING AV C-STRIDSMEDEL]

Goeran Olofsson Nov. 1981 17 p refs In SWEDISH

(FOA-C-40142-C1) Avail: NTIS HC A02/MF A01

The adsorption of dimethyl - (2.2) dichlorovinyl) phosphate at a concentration of 20 mg/cu m of air by 11 oximes known to adsorb organic phosphorus compounds is discussed. Mass was measured by recording the frequency shift of a piezoelectric crystal when covered by an oxime film; the thickness was controlled with an ellipsometer. The conductivity of the oxime film bound to a glass substrate fitted with gold electrodes was measured. In many oxime films, reversible adsorption occurs while the concentration in the film is more or less proportional to the concentration in the air. To get the desired sensitivity, the oxime film must not be thicker than a few molecules. Results show important differences in the adsorption ability of the oximes. Some of them adsorb the organic phosphorus compounds well enough to be used for detection. Author (ESA)

24 COMPOSITE MATERIALS

Includes laminates.

N82-22313*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMPRESSION BEHAVIOR OF UNIDIRECTIONAL FIBROUS COMPOSITE

J. H. Sinclair and C. C. Chamis 1982 20 p refs Presented at Symp. on Compression Testing of Homogeneous Mater. and Composites, Williamsburg, Va., 10-11 Mar. 1982; sponsored by Am. Soc. for Testing and Materials

(NASA-TM-82833; E-1145; NAS 1.15:82833) Avail: NTIS HC A02/MF A01 CSCL 11D

The longitudinal compression behavior of unidirectional fiber composites is investigated using a modified Celanese test method with thick and thin test specimens. The test data obtained are interpreted using the stress/strain curves from back-to-back strain gages, examination of fracture surfaces by scanning electron microscope, and predictive equations for distinct failure modes including fiber compression failure, Euler buckling, delamination, and flexure. The results show that the longitudinal compression fracture is induced by a combination of delamination, flexure, and fiber tier breaks. No distinct fracture surface characteristics can be associated with unique failure modes. An equation is described which can be used to extract the longitudinal compression strength knowing the longitudinal tensile and flexural strengths of the same composite system. M.G.

N82-22314*# Boeing Commercial Airplane Co., Seattle, Wash.

THE 737 GRAPHITE COMPOSITE FLIGHT SPOILER FLIGHT SERVICE EVALUATION Annual Report, May 1980 - Apr. 1981

Randy L. Coggeshall Feb. 1982 50 p refs

(Contract NAS1-11668)

(NASA-CR-165826; NAS 1.26:165826; D6-37330; AR-7) Avail: NTIS HC A03/MF A01 CSCL 11D

A flight service report was prepared which covers the flight service experience of 111 graphite epoxy spoilers on 737 transport aircraft and related ground based environmental exposure of graphite epoxy material specimens. Spoilers were installed on 28 aircraft representing seven major airlines operating throughout the world. Tests of removed spoilers after the seventh year of service continue to indicate modest changes in composite strength properties. Two spoilers were tested, one with 6 and one with 7 years of service, and both had residual strengths that fall within the original static strength scatter band. Both these units had typical service included discrepancies when tested. Based on visual, ultrasonic, and destructive inspection there continues to be no evidence of moisture migration into the honeycomb core and no core corrosion in the deployed units. M.D.K.

N82-22315*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

DEVELOPMENT AND DEMONSTRATION OF MANUFACTURING PROCESSES FOR FABRICATING GRAPHITE/LARC 160 POLYIMIDE STRUCTURAL ELEMENTS Final Report

R. K. Frost, J. S. Jones, P. J. Dynes, and D. H. Wykes Dec. 1981 499 p refs

(Contract NAS1-15371)

(NASA-CR-165809; NAS 1.26:165809) Avail: NTIS HC A21/MF A01 CSCL 11D

The development and demonstration of manufacturing technologies for the structural application of Celion graphite/LARC-160 polyimide composite material is discussed. Process development and fabrication of demonstration components are discussed. Process development included establishing quality assurance of the basic composite material and processing, nondestructive inspection of fabricated components, developing processes for specific structural forms, and qualification of processes through mechanical testing. Demonstration components were fabricated. The demonstration components consisted of flat laminates, skin/stringer panels, honeycomb panels, chopped fiber compression moldings, and a technology demonstrator segment (TDS) representative of the space shuttle aft body flap. R.J.F.

N82-22316*# Lockheed-California Co., Burbank.
FLIGHT SERVICE EVALUATION OF KEVLAR-49 EPOXY COMPOSITE PANELS IN WIDE-BODIED COMMERCIAL TRANSPORT AIRCRAFT Annual Flight Service Report
Robert H. Stone Jan. 1982 56 p refs
(Contract NAS1-11621)
(NASA-CR-165841; NAS 1.26:165841) Avail: NTIS HC A04/MF A01 CSCL 11D

Kevlar-49 fairing panels, installed as flight service components on three I-1011's, were inspected after 8 years service. The fairings had accumulated a total of 62,000 hours, with one ship set having 20,850 hours service. Kevlar-49 components were found to be performing satisfactorily in service with no major problems. The only defects noted were minor impact damage, a few minor disbonds and a minor degree of fastener hole fraying and elongation. The service history to date indicates that Kevlar-49 epoxy composite materials have satisfactory service characteristics for use in aircraft secondary structures. R.J.F.

N82-22317*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LONG-TERM THERMAL DEGRADATION AND ALLOYING CONSTITUENT EFFECTS ON FIVE BORON/ALUMINUM COMPOSITES
George C. Olsen Apr. 1982 107 p refs
(NASA-TP-1977; L14779; NAS 1.60:1977) Avail: NTIS HC A06/MF A01 CSCL 11D

Thermal exposure effects on the properties of five boron/aluminum composite systems were experimentally investigated. The composite systems were 49 volume percent boron fibers (203 micron diameter) in aluminum-alloy matrices 1100 Al, 2024 Al, 3003 Al, 5052 Al, and 6061 Al. Specimens were thermally exposed up to 10,000 hours at 500 K and 590 K, up to 500 hours at 730 K, and up to 10,000 hours at 500 K and 590 K, up to 500 hours at 730 K, and up to 2000 thermal cycles between 200 K and 590 K. Composite longitudinal and transverse tensile strengths, longitudinal compression strength, and in-plane shear strength were determined. None of the systems was severely degraded by exposure at 590 K. The best performing system was B-2024 Al. Effects of matrix alloys on degradation mechanisms were experimentally investigated. Composite specimens and individual fibers were metallurgically analyzed with a scanning electron microscope and an electron microprobe to determine failure characteristics, chemical element distribution, and reaction layer morphology. Alloying constituents were found to be affect the composite degradation mechanisms as follows: alloys containing iron, but without manganese as a stabilizer, caused increased low-temperature degradation; alloys containing magnesium, iron, or manganese caused increased degradation; and alloys containing copper caused increased fiber strength.
M.G.

N82-22318*# Boeing Commercial Airplane Co., Seattle, Wash.
DEVELOPMENT OF QUALITY ASSURANCE METHODS FOR EPOXY GRAPHITE PREPREG
J. S. Chen and A. B. Hunter Washington NASA Mar. 1982 221 p refs
(Contract NAS1-15222)
(NASA-CR-3531; NAS 1.26:3531) Avail: NTIS HC A10/MF A01 CSCL 11D

Quality assurance methods for graphite epoxy/prepregs were developed. Liquid chromatography, differential scanning calorimetry, and gel permeation chromatography were investigated. These methods were applied to a second prepreg system. The resin matrix formulation was correlated with mechanical properties. Dynamic mechanical analysis and fracture toughness methods were investigated. The chromatography and calorimetry techniques were all successfully developed as quality assurance methods for graphite epoxy preprags. The liquid chromatography method was the most sensitive to changes in resin formulation. The were also successfully applied to the second prepreg system.
S.L.

N82-22319# National Mechanical Engineering Research Inst., Pretoria (South Africa). Special Projects Div.
DEVELOPMENT OF THE CARBON FIBRE-POLYSULPHONE EXPANDING RIVET AND BOLLARD
M. S. Hunt May 1981 20 p refs
(CSIR-ME-1708; ISBN-0-7988-14772) Avail: NTIS HC A02/MF A01

Carbon fiber reinforced polysulphone expanding rivets were successfully developed and used in the field of orthopedic surgery. The materials used are biomedically compatible, and they are readily adaptable as 'bollards' for use with carbon fiber tows in the repair of ligaments. The principle of the expanding rivet based on a drive in central peg proved satisfactory. S.L.

N82-22320# Rolls-Royce Ltd., Derby (England).
CARBON-CARBON FIBRES: CARBON COMPOSITE MATERIALS
J. J. Choury Aug. 1981 31 p Transl. into ENGLISH from l'Aeron. et l'Astron. (France), v. 68, 1981 p 30-43 Partly in ENGLISH and FRENCH
(PNR-00098; Trans-15789/TLT-00831) Avail: NTIS HC A03/MF A01

Carbon reinforced phenolic compounds and carbon-carbon fibers are compared with conventional materials such as polycrystalline graphites and pyrographite. The value of carbon--carbon fibers as nozzle materials is stressed. The variation in their ablation behavior from that of phenolic to that of pyrographite compounds is noted since these categories constitute the two extremes of the ablation materials group. An ablation test in the presence of a propellant gas confirms the laws governing the ablation behavior of carbon-carbon materials. These laws indicate that the ablation behavior of carbon-carbon materials should vary in linear fashion as a function of their density. The advantages of carbon fibers over polycrystalline graphites and pyrographite include their greater resistance to thermal stresses, better embrittlement characteristics, low coefficient of expansion, and better isotropic qualities. Author (ESA)

N82-22321*# Advanced Research and Applications Corp., Sunnyvale, Calif.
LONG-TERM INFLUENCE OF PHYSICAL AGING PROCESSES IN EPOXY MATRIX COMPOSITES Final Report
Eric S. W. Kong Feb. 1981 35 p refs
(Contract NAS2-10480)
(NASA-CR-166329; NAS 1.26:166329) Avail: NTIS HC A03/MF A01 CSCL 11D

Selected mechanical properties of (plus or minus 45 degree sub 4s) graphite/epoxy composites were found to be affected by sub T sub g annealing. Postcured specimens of Thornel 300 graphite/Narmco 5208 epoxy were sub T sub G annealed at 413 K (140 C) for ca. 10 to the first through 10 to the fifth powers min., with a prior quenching from above T sub g. The ultimate tensile strength, strain-to-break, and toughness of the composite were found to decrease as a function of sub T sub g annealing time. The time-dependent change in properties can be explained on the basis of physical aging which is related to free volume changes in the non-equilibrium glassy state of network epoxies. The results imply possible changes in composite properties with service time. Author

N82-22322# General Electric Co., St. Petersburg, Fla. Metallurgy Lab.
DEVELOPMENT OF A LOW-LOSS MAGNETIC COMPOSITE UTILIZING AMORPHOUS METAL FLAKE Final Report
L. Johnson Mar. 1981 132 p
(Contract DE-AC01-78ET-29313)
(DE82-001088; DOE/ET-29313/T1) Avail: NTIS HC A07/MF A01

It is estimated that more than 35 x 10 to the 9th power kW hrs of electrical energy are lost annually in the USA in the core laminations of motors. Analysis and experimental measurements indicate that if amorphous metals were used in motors, these motor iron losses could be reduced by as much as 80%. The feasibility of producing amorphous metal in a form which could be utilized in a motor core at low cost while retaining its excellent magnetic properties was established. Two different development approaches were taken. The first approach was to develop a process method to produce a solid composite material consisting of amorphous metal flake and a suitable binder, and then to consolidate these flakes with a binder into a high density, stable composite. The second approach examined the feasibility of directly casting amorphous metal in the form of a continuous helix. Such a continuous helix, bonded into a

cylindrical form, would serve as a motor stator core and conductor slots could possibly be cast directly in the edge of the helical ribbon. However, it was established that helical ribbon with good properties could be made, and that further evaluation should be made of methods for casting conductor slots. T.M.

N82-22323# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.

CARBON SHORT FIBER TECHNOLOGY [C-KURZFASER-TECHNOLOGIE]

H. Richter 27 Jan. 1981 28 p refs In GERMAN Presented at VDI-Fachtagung: Verarbeiten u. Anwenden kohlenstoff-faser verstaerkter Kunststoffe, Baden-Baden, West Germany, 5-6 May 1981

(MBB-BB-476-81-O) Avail: NTIS HC A03/MF A01

Characteristics and processing possibilities for single fibers and hybrid materials, especially with C-fibers, glass fibers, and epoxy resins were examined. Composite materials produced with the right short fibers, obtain almost the same characteristics as comparative infinite fiber materials. The drum filter (VTV) alignment method is developed, which enables the production of unidirectional short fiber location. The straightening method is based on hydrodynamic principles: the short fibers are straightened by controlled currents and then distributed over the drum surface. The produced fiber location is prepared by a cleaning and preservation process, and is then shaped under the effects of pressure and temperature. The advantages of these composite materials are the possibilities to produce complicated three dimensional parts and hybrid materials in elementary phases. Transl. by E.A.K.

N82-22324# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany).

SERVICE LIFE INVESTIGATION OF A SAILPLANE WING OF CFRP CONSTRUCTION

C. Kensche 1981 33 p refs In GERMAN; ENGLISH summary Presented at 17th OSTIV Congr., Paderborn-Haxterberg, West Germany, 26 May - 6 Jun. 1981

Avail: NTIS HC A03/MF A01

A sailplane wing of CFRP design was investigated to guarantee a higher stress level and longer service life than with glass fiber reinforced plastics and to define admissible design for the glider industry. Fatigue tests were run according to a block program. The residual wing strength was also tested. Periodic measurements are used to observe stiffness behavior during simulated service life. No change in stiffness is observed during the tests. Stress enhancement of 400 N/sq mm is admissible which increases service life from 3000 to 6000 hr. Author (ESA)

N82-22325# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.

BUCKLING OF PLATE STRIPS: AN EVALUATION OF SIX CARBON-EPOXY LAMINATES

J. F. M. Wiggenraad Mar. 1981 20 p refs Presented at Intern. Conf. on Composite Structures, Paisley, Scotland, Sep. 1981

(Contract NIVR-1894)

(NLR-MP-81008-U) Avail: NTIS HC A02/MF A01

Buckling tests were performed on unidirectional and fabric laminates in order to investigate how closely the test results could be estimated by classical plate theory. Test facilities are described. The problem of deriving the buckling load from the test data is discussed, as well as the difficulties encountered in obtaining stiffness matrices with the lamination theory for these specimens. Experimental results and theory for Young's modulus, buckling load, and post-buckling behavior of the laminates are compared. Calculations which assume that the post-buckling deflection form of a plate can be approximated by a cosine function give good results, compared with computers, for loads where post-buckling is not significant. Good agreement exists for Young's modulus. Theoretical buckling loads were higher than experimental ones. Author (ESA)

N82-22149# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

IDENTIFICATION OF MECHANICAL CHARACTERISTICS OF A STRUCTURE IN COMPOSITE MATERIAL

L. Barthe, H. Berger, J.-P. Chaquin, and R. Ohayon *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-5, Sep. - Oct. 1981 (ESA-TT-725) Feb. 1982 p 35-41 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), No. 1981-5, Sep. - Oct. 1981 (For primary document see N82-22145 13-01)

Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 45

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also 77 *Thermodynamics and Statistical Physics*.

N82-22326*# Westinghouse Electric Corp., Concordville, Pa. Combustion Turbine Systems Div.

LOW NO SUB x HEAVY FUEL COMBUSTOR CONCEPT PROGRAM. PHASE 1A: COMBUSTION TECHNOLOGY GENERATION COAL GAS FUELS Final Report

T. P. Sherlock Feb. 1982 57 p refs

(Contracts DEN3-146; DE-AI01-77ET-13111)

(NASA-CR-165614; DOE/NASA/0146-2; NAS 1.26:165614)

Avail: NTIS HC A04/MF A01 CSCL 20B

Combustion tests of two scaled burners using actual coal gas from a 25 ton/day fluidized bed coal gasifier are described. The two combustor configurations studied were a ceramic lined, staged rich/lean burner and an integral, all metal multiannual swirl burner (MASB). The tests were conducted over a range of temperature and pressures representative of current industrial combustion turbine inlet conditions. Tests on the rich lean burner were conducted at three levels of product gas heating values: 104, 197 and 254 btu/scf. Corresponding levels of NOx emissions were 5, 20 and 70 ppmv. Nitrogen was added to the fuel in the form of ammonia, and conversion efficiencies of fuel nitrogen to NOx were on the order of 4 percent to 12 percent, which is somewhat lower than the 14 percent to 18 percent conversion efficiency when src-2 liquid fuel was used. The MASB was tested only on medium btu gas (220 to 270 btu/scf), and produced approximately 80 ppmv NOx at rated engine conditions. Both burners operated similarly on actual coal gas and erbs fuel, and all heating values tested can be successfully burned in current machines. S.L.

N82-22327*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CROSS-LINKED POLYVINYL ALCOHOL FILMS AS ALKALINE BATTERY SEPARATORS

Dean W. Sheibley, Michelle A. Manzo, and Olga D. Gonzalez-Sanabria Mar. 1982 19 p refs Presented at the 158th Meeting of the Electrochim. Soc., Hollywood, Fla., 5-10 Oct. 1980

(NASA-TM-82802; E-1141; NAS 1.15:82802) Avail: NTIS HC A02/MF A01 CSCL 07D

Cross-linking methods were investigated to determine their effect on the performance of polyvinyl alcohol (PVA) films as alkaline battery separators. The following types of cross-linked PVA films are discussed: (1) PVA-dialdehyde blends post-treated with an acid or acid periodate solution (two-step method) and (2) PVA-dialdehyde blends cross-linked during film formation (drying) by using a reagent with both aldehyde and acid functionality (one-step method). Laboratory samples of each cross-linked type of film were prepared and evaluated in standard separator screening tests. The pilot-plant batches of films were prepared and compared to measure differences due to the cross-linking method. The pilot-plant materials were then tested in nickel oxide - zinc cells to compare the two methods with respect to performance characteristics and cycle life. Cell test results are compared with those from tests with Celgard. Author

N82-22328*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala. .

MICROELECTROPHORESIS OF SELECTED MINERAL PARTICLES

Blair J. Herren, Ruby W. Tipps, and Kathleen D. Alexander Jan. 1982 16 p refs
(NASA-TM-82467; NAS 1.15:82467) Avail: NTIS HC A02/MF A01 CSCL 07D

Particle mobilities of ilmenite, labradorite plagioclase, enstatite pyroxene, and olivine were measured with a Rank microelectrophoresis system to evaluate indicated mineral separability. Sodium bicarbonate buffer suspension media with and without additives (0.0001 M DTAB and 5 percent v/v ethylene glycol) were used to determine differential adsorption by mineral particles and modification of relative mobilities. Good separability between some minerals was indicated; additives did not enhance separability. Author

N82-22329*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DEAERATOR/MIXER FOR LIQUIDS Patent Application
Samual T. Yamauchi, inventor (to NASA) (Rockwell International Corp., Downey, Calif.) Filed 25 Nov. 1981 13 p Sponsored by NASA
(NASA-Case-MSC-18936-1; US-Patent-Appl-SN-325082) Avail: NTIS HC A02/MF A01 CSCL 07D

A liquid degassifier including a containment vessel, a liquid pump, and a header assembly within the containment vessel is described. The pump draws from a reservoir and outputs to the header assembly, the latter being constructed to return the liquid to the reservoir in the form of a stacked plurality of vertically spaced, concentric, conical cascades via a series of orifices. The vacuum source which provides a partial vacuum in the containment vessel to enhance the degassing process is also described. NASA

N82-22330*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CARBON-CATALYZED OXIDATION OF SO2 BY NO2 AND AIR
Robert S. Rogowski, David R. Schryer, Wesley R. Cofer, III, Robert A. Edahl, Jr., and Shekhar Munavalli (Livingstone College) Apr. 1982 10 p refs Submitted for publication
(NASA-TP-2014; L-15214; NAS 1.60:2014) Avail: NTIS HC A02/MF A01 CSCL 07D

A series of experiments was performed using carbon particles (commercial furnace black) as a surrogate for soot particles. Carbon particles were suspended in water, and gas mixtures were bubbled into the suspensions to observe the effect of carbon particles on the oxidation of SO2 by air and NO2. Identical gas mixtures were bubbled into a blank containing only pure water. After exposure each solution was analyzed for pH and sulfate. It was found that NO2 greatly enhances the oxidation of SO2 to sulfate in the presence of carbon particles. The amount of sulfate found in the blanks was significantly less. Under the conditions of these experiments no saturation of the reaction was observed and SO2 was converted to sulfate even in a highly acid medium (pH > or = 1.5). R.J.F.

N82-22331# Chemical Engineering Research Group, Pretoria (South Africa).
CRACKING ACTIVITY OF ZEOLITE Y CATALYSTS SYNTHESIZED FROM A SOUTH AFRICAN
M. G. Howden Apr. 1981 28 p refs
(CSIR-CENG-365) Avail: NTIS HC A03/MF A01

Rare earth cation exchanged zeolite Y catalysts, rare earth acidic exchanged zeolite Y catalysts, and ultrastable zeolite Y catalysts with or without exchanged rare earth cations were prepared from ceramic microspheres which contained 24% NaY zeolites. A preliminary evaluation of the gas oil cracking activities of these catalysts and four commercial catalysts was made using a fixed bed reactor. Two of the prepared catalysts were tested also in a microactivity reactor. The synthezied catalysts showed no major differences in conversion performance compared with the commercial products. S.L.

N82-22332# Chemical Engineering Research Group, Pretoria (South Africa).
CALCULATION OF BET SURFACE AREA AND PORE SIZE DISTRIBUTION FROM NITROGEN ADSORPTION DATA
G. S. Hughes Dec. 1981 48 p refs
(CSIR-CENG-400; ISBN-0-7988-2311-9) Avail: NTIS HC A03/MF A01

A set of programs, namely PORES 3, PORES 4, ADSDES, PLOT, and BET are described which facilitate a comprehensive pore structure analysis, given the experimental data from a nitrogen adsorption study using a volumetric method. The adsorption study entails the measurement of equilibrium nitrogen pressures as a function of the volume of nitrogen adsorbed on a sample at liquid nitrogen temperature. An adsorption and desorption isotherm can thus be determined from which a complete pore structure analysis can be obtained. M.G.

N82-22333# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).
ELECTROMOTIVE FORCE MEASUREMENTS ON LIQUID COPPER IN EQUILIBRIUM WITH SOLID OR LIQUID COPPER (I) OXIDE
J. Osterwald 1982 15 p refs Transl. into ENGLISH from Z. Fuer Physik. Chem. Neue Folge (West Germany), no. 49, 1966 p 138-146
(ISSN-0077-5606) Avail: NTIS HC A02/MF A01

Electromotive force measurements were carried out between 1065 and 1300 deg in the cell M/Cu(1), Cu2O(s or 1)/ZrO2 + MgO/air, Pt where Cr2O3 proved to be the best material for the contact electrode, M. The oxygen partial pressure over the equilibrium mixture Cu(1)-Cu2O(s or 1), and the standard value of the free enthalpy of formation for Cu2O(s or 1) were determined. Author

N82-22334# Rockwell International Corp., Canoga Park, Calif.
INVESTIGATION OF COAL-GASIFICATION CATALYSIS-REACTION MECHANISMS Quarterly Technical Progress Report, Jan. - Mar. 1981
L. R. McCoy, J. P. Ampaya, R. C. Saunders, and L. A. Heredy Apr. 1981 19 p
(Contract DE-AC21-80MC-14592)
(DE82-003305; DOE/MC-14592/T2) Avail: NTIS HC A02/MF A01

The installation of a thermogravimetric analysis balance in a pressure enclosure capable of operation at up to 3.4 MPa with a char sample temperature of 850 C and the calibration of the balance and associated components are described. The system was placed in satisfactory operation, and essential calibration procedures were carried out. Procedures for preparation of catalyzed and noncatalyzed char from Illinois No. 6 coal obtained from the Pennsylvania State University Coal Data Bank were finalized, and char is produced on a routine basis. To expedite checkout of the balance system, experimental gasification of char with carbon dioxide was carried out. Initial gasification tests with CO2 show good reproducibility. T.M.

N82-22335# Georgia Univ., Athens. Dept. of Chemistry.
CHROMATOGRAPHIC STUDIES OF VANADIUM COMPOUNDS FROM BOSCAN CRUDE OIL
W. A. Spencer, J. A. Galobardes, M. A. Curtis, and L. B. Rogers Aug. 1981 42 p refs
(Contract DE-AS09-76ER-00854)
(DE82-000977; DOE/ER-00854/32) Avail: NTIS HC A03/MF A01

Vanadium-non-porphyrins were fractionated. Using graphite furnace atomic absorption, the signal for vanadium was found to follow the UV absorption of the chromatogram. In addition, a simpler, faster procedure was devised to isolate a vanadium porphyrin fraction that was more nearly free from both vanadium non-porphyrins and nickel porphyrins. Pyrolysis/GC with both the flame photometric (sulfur) detector and the flame ionization detector gave evidence for a variety of sulfur species in both the porphyrin and non-porphyrin fractions. DOE

N82-22336# Georgia Univ., Athens. Dept. of Chemistry.
EFFECT OF THE ORGANIC LIGAND ON THE FLAME-EMISSION RESPONSE FOR VANADIUM
Beverly J. Wood, J. A. Galobardes, and L. B. Rogers Aug. 1981 44 p refs
(Contract DE-AS09-76ER-00854)
(DE82-00976; DOE/ER-00854/33) Avail: NTIS HC A03/MF A01

Flame emission intensities from vanadium in the forms of

chelates of N-nitrosophenyl hydroxylamine and 8-quinolinol in methylisobutyl ketone were measured. Although differences in atomic absorption characteristics for vanadium bound by different ligands were reported, significant differences are not found in the emission intensities of these two chelates after subtracting signals for the appropriate blanks. T.M.

N82-22337# Burns and Roe, Inc., Woodbury, N. Y.
ASSESSMENT OF ATMOSPHERIC FLUIDIZED-BED COMBUSTION RECYCLE SYSTEMS Final Report
R. Rogali, J. Wysocki, and S. Kursman Oct. 1981 159 p refs
(EPRI Proj. 1180-1)
(DE82-900879; EPRI-CS-2091) Avail: NTIS HC A08/MF A01

A technical and economic evaluation of AFBC power plants with recycle systems, and a comparison of these plants with AFBC power plants with carbon burnup beds (CBB) and with pulverized coal fired power plants with flue gas desulfurization systems are presented. One thousand MWe plants burning both eastern and western coals are considered. The economic analyses are based on a plant located in the east central region of the United States with a 30 year life and a 70 percent capacity factor. The eastern coal fired plants are designed to burn Illinois bitminous coal with a higher heating value of 10,100 Btu/lb and a sulfur content of 4%. The required calcium to sulfur mole ratios for the eastern plants are 3.8:1 and 2.5:1 for the AFBC/CBB and AFBC/recycle plants, respectively. The western coal fired plants are designed to burn Wyoming subbituminous coal with a higher heating value of 8,020 Btu/lb and a sulfur content of 0.48%. The required calcium to sulfur mole ratios for the western plants are 0.7:1 and 0.4:1 for the AFBC/CBB and AFBC/recycle plants, respectively. DOE

N82-22338# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
RECENT DEVELOPMENTS IN LASER MAGNETIC RESONANCE SPECTROSCOPY
P. B. Davis (Cambridge Univ., England), W. Hack, and F. Temps Oct. 1981 56 p refs
(MPIS-15/1981; ISSN-0436-1199) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11,90

The principles and spectral features of laser magnetic resonance (LMR) are introduced and far IR LMR spectrometry was reviewed. Atom, diatomic, hydride, nonhydride, triatomic and polyatomic applications are discussed. Molecular ion spectroscopy, laboratory astrophysics, and reaction kinetics are also covered. Tuning transitions across the 100 to 1000 micron region are predicted which is useful in the far IR where there are no narrow band tunable laser sources for spectroscopy at zero field. The LMR method is the only technique available for spectroscopy of free radicals. No discoveries of laser lines in the mid-IR are reported, but alternative tunable sources, e.g. the semiconductor diode laser, cover this region for high resolution free radical spectroscopy. Author (ESA)

N82-22339# Institut fuer Erdoelforschung, Hanover (West Germany).
SECONDARY RECOVERY: CHANGING OF THE VISCOSITY AND COMPRESSIBILITY OF MINERAL OILS WITH DISSOLVED GAS Final Report, Jun. 1981
Eduard Kuss and Hermann Killesreiter Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 64 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-225; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13,40

The viscosity of selected oils, i.e. paraffinic oil, naphthene based distillate, and solvent extract, was measured with a capillary viscometer in dependence of pressure, temperature, and the mole fraction of dissolved gases N2, CO2, CH4, and C3H8. The results show decreasing viscosity with increasing gas concentration that amounts to nearly three orders of magnitude, using propane. Apart from absolute values of the viscosity, the general form of the curve for saturated isotherms in dependence of pressure is determined only by the gas and not by the oil. This facilitates estimations as with the model substances squalane and squalene. A high pressure piezometer for gas/oil solutions provides further interpretation of solubility isotherms. Author (ESA)

N82-22340# Grosskraftwerk A.G., Mannheim (West Germany).
STUDY PROJECT ON THE DESULFURIZATION OF FLUE GAS, USING THE BERGBAUFORSCHUNG (BF) PROCESS, AS PART OF THE INTEGRATED OPERATION OF A POWER PLANT WITH A CHEMICAL PLANT FOR PRODUCING SULFURIC ACID Final Report, May 1981
Hans Reosner and Michael Oed Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 36 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-229; ISSN-0340-7608) Avail: NTIS Hc A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 7,60

The BF process for the desulfurization of flue gas was investigated and improved. Operation of a prototype plant and of a demonstration plant, which was added onto a coal fired power plant, is described. Without cooling the flue gas, and using modified desorption at the demonstration plant, the BF process provides SO2 rich gas as an intermediate product that can be further processed into liquefied SO2 or into H2SO4. Production of H2SO4 by integrating chemical works into the power plant complex was followed up and is found cost feasible. The SO2 liquefaction scheme was not pursued. Any treatment of the enriched gas requires scrubbing. A waste treatment method that supplies a final product with good storage characteristics, after adding calcium hydroxide, is suggested. Author (ESA)

N82-22341# Stockholm Univ. (Sweden). Inst. of Physics.
THE SPECTRUM OF CuO: OBSERVED BANDS IN THE SPECTRAL REGION 3500 TO 8000 A
O. Appelblad Feb. 1981 40 p refs
(USIP-81-03) Avail: NTIS HC A03/MF A01

A thorough vibrational analysis was performed. Relative intensities of the band heads for a rotational temperature of 350 K were estimated. The wavelengths in air, vacuum wave numbers, and intensities of the observed band heads were tabulated. Altogether 400 band heads in the spectra from the two isotopic molecules CuO-63 and CuO-65 are shown Author (ESA)

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N82-22342 Illinois Univ. at Urbana-Champaign.
DIFFUSION OF HYDROGEN, DEUTERIUM, AND TRITIUM IN NIOBIUM Ph.D. Thesis
Gerald Robert Matusiewicz 1981 177 p
Avail: Univ. Microfilms Order No. 8127637

The diffusion of hydrogen in niobium was investigated over the temperature range 148-500 degrees Kelvin, using measurements of the elastic after effect caused by long range diffusion (the Gorsky Effect). Relaxation curves for pure annealed niobium were generally not of the single exponential form expected from the Gorsky Effect theory, but were described well by a sum of two exponential curves with different amplitudes and relaxation times. Relaxation curves for pure niobium that had been cold worked had the expected form, but the hydrogen diffusion deviated from an Arrhenius temperature dependence. The effects of oxygen and nitrogen interstitials on the diffusion were studied and were not in agreement with conventional trapping models. Deuterium and tritium diffusion in niobium were also studied, and a nonclassical isotope effect was observed. Hydrogen diffusion coefficients in several Nb-Te alloys were measured and the diffusivity in all these alloys exhibited a nonArrhenius temperature dependence. A model is presented which can account for the form of the relaxation curves observed in pure, annealed niobium. Dissert. Abstr.

N82-22343*# Eagle Engineering, Inc., Houston, Tex.
STUDY ON APPLICATION OF AEROSPACE TECHNOLOGY TO IMPROVE SURGICAL IMPLANTS Final Report
Robert E. Johnson and James L. Youngblood Mar. 1982 139 p refs
(Contract NAS1-16567)
(NASA-CR-165868; NAS 1.26:165868) Avail: NTIS HC A07/MF A01 CSCL 06B

The areas where aerospace technology could be used to improve the reliability and performance of metallic, orthopedic implants was assessed. Specifically, comparisons were made of material controls, design approaches, analytical methods and inspection approaches being used in the implant industry with hardware for the aerospace industries. Several areas for possible improvement were noted such as increased use of finite element stress analysis and fracture control programs on devices where the needs exist for maximum reliability and high structural performance. S.L.

N82-22344*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRIBOLOGICAL PROPERTIES AND XPS STUDIES OF ION PLATED GOLD ON NICKEL AND IRON
Kazuhisa Miyoshi, Talivaldis Spalvins, and Donald H. Buckley 1982 18 p refs Presented at Intern. Conf. on Met. Coatings, San Diego, Calif., 4-9 Apr. 1982; sponsored by American Vacuum Society
(NASA-TM-82814; E-1161; NAS 1.15:82814) Avail: NTIS HC A02/MF A01 CSCL 11F

Tribological and X-ray photoelectron spectroscopy analysis were conducted with ion plated gold films on nickel and iron substrates in sliding contact with metals and nonmetals in a vacuum of 3 x 10 nPa and in an argon atmosphere. The results obtained indicated a deeper graded interface when gold was ion plated on nickel than on iron. The deep graded interface between gold and nickel may be due to the solubility of material pairs. The gold and nickel in the graded interface can form an alloy. The gold in the graded interface with iron is atomically dispersed in the iron and thus forms a physically bonded interface. This is believed to be due primarily to implantation effects. The coefficient of friction, wear and transfer of gold in contact with metal or nonmetal were greater in a vacuum of 3 x 10 nPa than in argon. Gold films in contact with metals had a higher coefficient of friction, wear and transfer of gold than gold films in contact with the nonmetals. These observations resulted from the greater adhesion of gold to metals that to nonmetals. Author

N82-22345*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOLUTION POTENTIALS FOR SEVERAL ALUMINUM ALLOYS AS A FUNCTION OF AGING TIME
Merlin D. Danford Apr. 1982 17 p refs
(NASA-TM-82459; NAS 1.15:82458) Avail: NTIS HC A02/MF A01 CSCL 11F

The use of solution potentials as a means of determining the tempers of several aluminum alloys is reported. In general, the curves obtained are characterized by a rather sharp drop in solution potential during the first few hours of aging, followed by an inflection or knee, where the shape of the curve changes fairly abruptly and the potentials decrease very slowly with further aging. Times of aging reported in the literature are fairly consistent with the positions of the knees of the curves so obtained, and solution potentials obtained for the various tempers are generally in good agreement with values reported in the literature. Author

N82-22346*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE OF LASER GLAZED ZrO2 TBCs IN CYCLIC OXIDATION AND CORROSION BURNER TEST RIGS
I. Zaplatynsky 1982 21 p refs Presented at the Intern. Conf. on Met. Coatings and Process Technol., San Francisco, 4-8 Apr. 1982; sponsored by the American Vacuum Society
(NASA-TM-82830; E-1195; NAS 1.15:82830) Avail: NTIS HC A02/MF A01 CSCL 11F

The performance of laser glazed zirconia thermal barrier coatings (TBCs) was evaluated in cyclic oxidation and cyclic corrosion tests. Plasma sprayed zirconia coatings of two thicknesses were partially melted with a CO2 laser. The power density of the focused laser beam was varied from 35 to 75 W/sq mm, while the scanning speed was about 80 cm per minute. In cyclic oxidation tests, the specimens were heated in a burner rig for 6 minutes and cooled for 3 minutes. It is indicated that the laser treated samples have the same life as the untreated ones. However, in corrosion tests, in which the burner rig flame contained 100 PPM sodium fuel equivalent, the laser treated samples exhibit nearly a fourfold life improvement over that of the reference samples vary. In both tests, the lives of the samples inversely with the thickness of the laser melted layer of zirconia. E.A.K.

N82-22347*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METHOD AND APPARATUS FOR COATING SUBSTRATES USING LASERS Patent Application
Isidor Zaplatynsky, inventor (to NASA) Filed 15 Mar. 1982 9 p
(NASA-Case-LEW-13526-1; US-Patent-Appl-SN-358398) Avail: NTIS HC A02/MF A01 CSCL 11F

A method for coating substrates using lasers is described. Metal substrates, preferably of titanium and titanium alloys, were coated by alloying or forming TiN on a substrate surface. In the process a laser beam strikes the surface of a moving substrate in the presence of purified nitrogen gas. A small area of the substrate surface is quickly heated, without melting, and reacts with the nitrogen to form a solid solution. This process of alloying or forming TiN, which occurs by diffusion of nitrogen into the titaninum, is reviewed. NASA

N82-22348# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
CRITICAL METALS CONSERVATION, RECYCLING AND SUBSTITUTION
E. F. Bradley (Pratt and Whitney Aircraft) Jan. 1982 23 p Presented at the 53rd Meeting of the AGARD Struct. and Mater. Panel, Noordwijkerhout, Netherlands, 27 Sep. - 2 Oct. 1981
(AGARD-R-693; ISBN-92-835-1412-2) Avail: NTIS HC A02/MF A01

Critical metals are reviewed relative to their current importance to the aerospace industry. The roles of conservation, recycling, substitution, stockpiling and market place operations are analyzed. Technologies are discussed relative to their effects on the critical metals, and finally, suggestions are presented for meeting material supply problems. S.L.

N82-22349*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SURFACE CHEMISTRY, MICROSTRUCTURE AND FRICTION PROPERTIES OF SOME FERROUS-BASE METALLIC GLASSES AT TEMPERATURES TO 750 C
Kazuhisa Miyoshi and Donald H. Buckley Apr. 1982 16 p refs
(NASA-TP-2006; E-1001; NAS 1.60:2006) Avail: NTIS HC A02/MF A01 CSCL 11B

X-ray photoelectron spectroscopy analysis, transmission electron microscopy, diffraction studies, and sliding friction experiments were conducted with ferrous-base metallic glasses in sliding contact with aluminum oxide at temperatures from room to 750 C in a vacuum of 30 nPa. The results indicate that there is a significant temperature influence on the friction properties, surface chemistry, and microstructure of metallic glasses. The relative concentrations of the various constituents at the surface of the sputtered specimens were very different from the normal bulk compositions. Contaminants can come from the bulk of the material to the surface upon heating and impart boric oxide and silicon oxide at 350 C and boron nitride above 500 C. The coefficient of friction increased with increasing temperature to 350 C. Above 500 C the coefficient of friction decreased rapidly. The segregation of contaminants may be responsible for the friction behavior. Author

N82-22350# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
RSV AGAINST STEEL ARMOR PLATING [RSV MOT STAALPANSAR]
Jan Ekberg Apr. 1981 32 p refs In SWEDISH

(FOA-C-20406-D4) Avail: NTIS HC A03/MF A01

Tests were run in order to find the degree of protection and the shape of the stand off curve for a RSV loaded with small caliber ammunition against a tank KATF 415-8. Eighteen 45 mm RSV loads containing 93% pressed octogen were exploded against 10 mm thick target plates (made of SIS1311 iron and armor KATF 415-8) stacked in a target stack. Detonation distances: 2, 6, 8, 10, 13.5, and 20 times the ammunition caliber with 3 shots at each distance. The Brenell hardness of each plate was measured as well as the penetration distance and the diameter of the hole. J.M.S.

N82-22351# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.

SINTERED TUNGSTEN ALLOY: DEFORMATION TEXTURES AND TEMPERING IN THE TUNGSTEN PHASE [SINTRAD VOLFRAMKOMPOSIT. UNDERSOEKNING AV DEFORMATIONSTEXTUR OCH AATERHAEMTNING I VOLFRAMFASEN]

Nils Artloeve and Gunnar Verngren Jun. 1981 51 p refs In SWEDISH

(FOA-C-20415-D4) Avail: NTIS HC A04/MF A01

Melting phase sintered tungsten (90% tungsten, 7% nickel, 3% iron) constitutes a composition with tungsten particles in a soft matrix. Microscopic examination of this composition reveals the texture that arises due to structural deformation as well as recrystallization when heat treated. The results give important data for evaluating the possibilities of improving the mechanical properties of the material through tooling and heat treatment. J.D.

N82-22352# Rolls-Royce Ltd., Derby (England).

CREEP PROPERTIES OF SINGLE CRYSTALS OF NICKEL-BASE SUPERALLOYS. 1: HIGH TEMPERATURE CREEP (980 C)

C. Carry, C. Houis, and J. L. Strudel 1981 19 p refs Transl. into ENGLISH from Mem. et Etudes Sci. Rev. de Metal. (France), Mar. 1981 p 139-146 In ENGLISH and FRENCH

(PNR-90094; Trans-15814/TLT-00840) Avail: NTIS HC A02/MF A01

The creep properties of homogeneous and finely dendritic single crystals of MAR M200 at 980 C are described. The results and observations of the microstructures after deformation reveal that this industrial alloy has the same elementary deformation mechanisms as those found for an experimental alloy containing a smaller proportion of hardening phase. Tests show that carbon promotes the growth of M6C type carbides in the center of the dendrites, reducing the mechanical strength of components. The initial creep stage covers an incubation period lasting a few hours. There is a secondary steady state creep stage. The accelerating creep rate stage begins very early and covers more than 50% of the life of a single crystal. Slightly segregated solidification structures have more favorable characteristics than homogeneous structures or greatly segregated structures with coarse dendrites. Author (ESA)

N82-22353# Rolls-Royce Ltd., Derby (England).

INVESTIGATION INTO THE PRECIPITATION OF THE SIGMA PHASE IN LOW CARBON Ni-Co-Cr-Mo ALLOYS

Claude Morizot, Yves Honnorat, and Alain Vignes Feb. 1981 14 p refs Transl. into ENGLISH from Comptes Rendus of Acad. of Sci. (Paris), v. 272, Ser. C, 2 Jun. 1971 p 1796-1799 In ENGLISH and FRENCH

(PNR-90095; Trans-15445/TLT-00811) Avail: NTIS HC A02/MF A01

The precipitation mechanisms for the sigma phase of alloys in the solid phase were investigated by holding samples at 1300 C for 64 hr in an argon atmosphere, followed by air hardening. Alloys similar in composition to the austenitic matrix of a UDIMET super refractory alloy after precipitation of the carbides and the gamma prime hardening phase were examined. Electron probe microanalysis shows that the sigma phase is due to very high segregation of molybdenum and a high negative segregation of nickel and cobalt. Chromium shows no marked segregation. Nucleation occurs by preference at the grain boundaries, which very rapidly become saturated. Temperature determines the morphology of the precipitates which appear on the intergranular sites. Author (ESA)

N82-22354# Rolls-Royce Ltd., Derby (England).

INVESTIGATIONS CONCERNING THE PRODUCTION OF HIGH-STRENGTH MAGNESIUM ALLOYS CONTAINING YTTRIUM

N. V. Miklina and Ye. Ya. Solomonik, ed. Sep. 1981 24 p refs Transl. into ENGLISH from Zarubezhnaya Tekhnika (USSR) p 81-87 In ENGLISH and RUSSIAN

(PNR-90102; Trans-15874/TLT-00844) Copyright. Avail: NTIS HC A01/MF A01

The nature of the interactions in the magnesium yttrium system, the solubility of yttrium in solid magnesium, and the structure of the phases during these interactions is summarized. The action of yttrium on magnesium is similar to that of other rare earth elements, but the greater solubility of yttrium increases its influence on alloy strength. Yttrium forms a high melting chemical compound Mg24Y5 along the grain boundaries of a solid magnesium solution, significantly lowers its melting point, and increases the recrystallization temperature of the alloys. The phase properties of Mg24Y5 show that alloys capable of working at up to 300 C can be produced. Greatest hardness and strength is obtained in material aged immediately after rolling, and not after quenching. Author (ESA)

N82-22355# Rolls-Royce Ltd., Derby (England).

STUDY OF THE KINETICS OF METAL FAILURE DURING THE FORMING OF A CASTING

A. G. Kryychkov, L. G. Gribov, A. V. Vchinnikov, and Ch. M. Shadkin May 1981 6 p refs Transl. into ENGLISH from Liteinoye Proizvodstvo (USSR), no. 2, 1981 p 22-23 In ENGLISH and RUSSIAN

(PNR-90105; Trans-15686/TLT-00826) Copyright. Avail: NTIS HC A02/MF A01

Cracking in a medium alloy austenitic steel specimen during casting was studied. A loading system in which the tensile stresses in the cast specimen are produced by mechanical arrest of linear shrinkage proportionately to increasing load by dynamometer was used. Type I specimens with stress raiser in the form of a V bend in the bar were tested. Under eccentric tensile loading, a triaxial stress state prevails at the root of the notch with the permanent set along one of the coordinates being limited. A flat transverse crack forms at the V. Microscopy of the specimen fracture face shows that the crack includes: a zone next to the surface in the form of a strongly oxidized brittle fracture with traces of fine dendritic structure; an intermediate zone in the form of a brittle fracture with less oxidized crystallites; and very prominent crystallites at the crack tip with a flat unoxidized fracture face. The depth (or area) of the cracked zones depends on the applied loading rigidity. Author (ESA)

N82-22356# Dechema-Inst., Frankfurt am Main (West Germany).

PURIFICATION OF SOLUTIONS CONTAINING METALS BY PACKED BED ELECTROLYSIS: PROCESS ENGINEERING Final Report, Jul. 1981

Gerhard Kreysa and Klaus Starzynski Bonn Bundesministerium fuer Forschung und Technologie Jan. 1982 50 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-82-007; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10,50

A packed bed cell of optimum geometry for purification of metal-containing waste water was developed and tested. For continuous concentration measurement of metal, flow through photometry and a diffusion limited current cell were used. Operational parameters of packed bed electrolysis were optimized and the membrane apparatus as well as the cell construction were improved. Regeneration of the packed bed was carried out by anodic dissolution with winning of concentrated regenerate solution. Results for waste water containing copper show that it is possible to obtain a final concentration of 0.5 ppm over 200 hr continuous operation. The cell behavior is also described theoretically by a simulation model. Calculated concentration profiles at the cell outlet are in good agreement with experimental data. Author (ESA)

N82-22357# Societe Nationale Industrielle Aerospatiale, Suresnes (France). Lab. Central.

FATIGUE EVALUATION OF ALUMINUM ALLOY CASTINGS

Cazard and Budillon 7 Dec. 1981 27 p In FRENCH Presented at Franco-Soviet Symp., Moscow, 4-11 Jan 1982
(SNIAS-821-210-101; C-43-449) Avail: NTIS HC A03/MF A01

The influence of quenching rate, surface finish die casting, and sand casting on aircraft industry aluminum alloys was studied. Tensile and fatigue tests were applied. In static tensile tests, A-S7U2G and A-U423G perform best. Quenching improves ductility. There is good correlation between test breaking stress of manufactured parts and stress resistance of alloy samples. In fatigue tests, A-S7U2G is slightly better than the others. For a 100.000 cycle life, a limit of 140 MPa is possible (compared with 180 MPa for 7175 T 7551 rolled strip steel). Sandblasting improves fatigue behavior on the order of one to three. Die casting is advantageous economically rather than technically. Sand casting produces more external faults than die casting.
Author (ESA)

N82-22358# Rolls-Royce Ltd., Derby (England).
POWDER METALLURGICAL INNOVATIONS FOR IMPROVED HOT SECTION ALLOYS IN AERO-ENGINE APPLICATIONS

P. Wildgoose, N. G. Turner, H. F. Davies, B. J. Helliwell, R. Ubank, and H. Harrison 1980 27 p refs
(PNR-90072) Avail: NTIS HC A03/MF A01

The state of the art in powder material and processes, for aircraft engine combustor, blade, and disk alloys, was reviewed. Processes developed in the 1970's include: gas atomization of superalloy powder for critical rotating parts; rotating electrode atomization for titanium powder in similar components; controled thermomechanical processing of attrited powders in order to produce superalloy sheet and airfoil parts; and plasma sprayed gas atomized powder for hot section overlay and thermal barrier coatings. Development in titanium powder metallurgy is hampered by difficulties in obtaining clean powder. Properties equivalent to a conventionally processed product are obtained in current alloys, with possible cost advantages. Author (ESA)

N82-22359# Rolls-Royce Ltd., Derby (England).
EFFECT OF SLIGHT VARIATIONS IN ALLOY COMPOSITION AND DIFFERENT CASTING CONDITIONS ON THE STRUCTURAL STABILITY AND LONG-TERM BEHAVIOR OF THE NICKEL-BASED SUPERALLOYS IN 738 JC, B1900 AND MAR M200 Final Report

Adolf Donner Feb. 1981 83 p refs Transl. into ENGLISH from Thyssen Giesserei AG (Bochum, West Germany), Oct. 1980 Partly in ENGLISH and GERMAN
(PNR-90091; Trans-15610/TLT-00822) Avail: NTIS HC A05/MF A01

The influence of the initial structure of high temperature nickel supperalloys on time dependent creep properties was investigated. Samples were cast, using different casting and solidification conditions, in order to produce coarse and fine grain structures, with and without microporosity. The chemical composition was varied slightly in order to give three N sub v numbers. Creep tests show no significant effect of grain size and microporosity on the life of the material. A tendency towards a shorter life for specimens with N sub v + values compared with N sub v - and N sub v-0 is noted. Author (ESA)

N82-22360# National Aerospace Lab., Amsterdam (Netherlands). Div. of Structures and Materials.
ENGINEERING PROPERTY COMPARISONS OF 7050-T73651, 7010-T7651 AND 7010-T73651 ALUMINUM ALLOY PLATE

L. Schra and W. G. J. tHart Dec. 1980 33 p refs Submitted for publication
(NLR-MP-80047-U) Avail: NTIS HC A03/MF A01

The strength, stress corrosion resistance, fracture toughness and fatigue crack propagation resistance under flight simulation loading of aluminum alloys was tested. Standard tensile, notch, center cracked and flight simulation tests were performed. In order to study stress corrosion crack initiation, tuning fork type specimens were clamped to a wheel which immersed them in a 3.5% aqueous NaCl solution for 10 min/hr. Testing lasted for two months. Results show that both 7050 and 7010 are high strength deep hardening alloys with only minor differences in crack tolerance properties. The fracture toughness of both alloys is equivalent, while 7050 possesses slightly better resistances to stress corrosion cracking and fatigue crack propagation under flight simulation loading. Author (ESA)

N82-22361 Illinois Univ. at Urbana-Champaign.
RAPID SOLIDIFICATION OF ALUMINUM POWDERS: HEAT FLOW MODELLING AND MICROSTRUCTURE Ph.D. Thesis

Carlos Gerardo LeviRodriguez 1981 205 p
Avail: Univ. Microfilms Order No. 8127631

The characterization of the thermal history of rapid solidification in metal droplets, and its effects on powder microstructure are investigated. The heat flow during solidification was modelled, and relationships were established between the atomization parameters, the growth kinetics, the interface velocity and undercooling, and other important variables. Numerical solutions based on the enthalpy model were developed, and their results compared to the trends predicted from the Newtonian model. The analysis covered situations of isothermal solidification at the melting temperature, as well as those where significant undercoolings are necessary for nucleation and growth. The implications of single vs. multiple nucleation were also discussed. When substantial undercoolings are achieved in the droplet prior to nucleation, the thermal history consists of two distinct solidification regimes. Dissert. Abstr.

N82-22179# Elbar B.V., Lomm (Netherlands).
A TITANIUM SILICON COATING FOR GAS TURBINE BLADES

G. H. Marijnissen *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1981 8 p refs (For primary document see N82-22172 13-01)
Avail: NTIS HC A08/MF A01

N82-22182# Canadian Westinghouse Co., Ltd., Hamilton (Ontario).
REJUVENATION OF USED TURBINE BLADES BY HOT ISOSTATIC PRESSING AND REHEAT TREATMENT

K. L. Cheung, C. C. Leach, K. P. Willett, and A. K. Koul (National Research Council of Canada) *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 6 p refs (For primary document see N82-22172 13-01)
Avail: NTIS HC A08/MF A01

N82-22183# Chromalloy Div.-Oklahoma, Midwest City.
HIP PROCESSING: POTENTIALS AND APPLICATIONS

W. J. vanderVet *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 16 p refs (For primary document see N82-22172 13-01)
Avail: NTIS HC A08/MF A01

N82-22184# National Physical Lab., Teddington (England).
REGENERATION OF THE CREEP PROPERTIES OF A CAST Ni-Cr-BASE ALLOY

H. R. Tipler *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 6 p refs (For primary document see N82-22172 13-01)
Avail: NTIS HC A08/MF A01

N82-22186# Elbar B.V., Lomm (Netherlands).
A NEW APPROACH TO THE WELDABILITY OF NICKEL-BASE, AS-CAST AND POWDER METALLURGY SUPERALLOYS

M. H. Haafkens and J. H. G. Matthey *In* AGARD Maintenance in Serv. of High Temp. Parts Jan. 1982 13 p refs (For primary document see N82-22172 13-01)
Avail: NTIS HC A08/MF A01

N82-23143# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
MECHANICAL PROPERTIES OF HOT ISOSTATIC PRESSED POWER METALLURGICAL (P/M-HIP) TITANIUM FOR HELICOPTER COMPONENTS

Wolfgang Keinath and Marko Tapavicza *In its* Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 30 p refs Presented at 7th DGLR European Rotorcraft and Powered Lift Aircraft Forum,

Garmisch-Partenkirchen, West Germany, 8-11 Sep. 1981 (For primary document see N82-23137 13-99)
(MBB-UD-324-81-OE) Avail: NTIS HC A09/MF A01

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N82-22362 Propellants, Explosives and Rocket Motor Establishment, Waltham Abbey (England). Joint Working Party on the Aging and Weathering of Polymers and Composites.

THE WEATHERING OF PLASTIC MATERIALS IN THE TROPICS. PART 6: THE FURTHER EVALUATION OF A SOLAR RADIATION CONCENTRATING DEVICE (EMMA) AS A MEANS OF ACCELERATING THE WEATHERING OF PLASTICS

1981 44 p refs
(BR80352) Copyright. Avail: Issuing Activity

A polyacetal homopolymer and a low density polyethylene were exposed on Sun following and concentrating devices (EMMA and EMMAQUA), and on static racks at 45 deg to the horizontal facing the equator. No clear evidence of acceleration is observed. Both materials become brittle between 7 and 16 weeks for all modes of exposure despite vast differences in radiation dosage. This trial shows no significant benefit to be gained in using EMMA and EMMAQUA instead of natural exposure.

Author (ESA)

N82-22363*# College of William and Mary, Williamsburg, Va. Dept. of Chemistry.

DEVELOPMENT OF CRITICAL MOLECULAR WEIGHT-PROPERTY SPECIFICATIONS FOR HIGH PERFORMANCE POLYMERS USED AS ADHESIVES AND COMPOSITES Final Report, period ending 18 Feb. 1982

David E. Kranbuehl 18 Feb. 1982 59 p refs
(Grant NsG-1095)
(NASA-CR-168790; NAS 1.26:168790) Avail: NTIS HC A04/MF A01 CSCL 07C

The polyimide resin, LARC-160, was prepared from diethyl-3, 3', 4,4'-benzophenone tetracarboxylate, ethyl-5-norbornene-2,3-dicarboxylate and Jeffamine AP-22. The imidization reactions of NE and BTDE were studied by HPLC, C-13-NMR and IR. NE imidizes slowly at 12 C; BTDE imidizes when the resin is heated above 100 C. Both imidization reactions proceed directly to the imide. Neither amic acid is present in significant quantities at any stage of the imidization reactions. The monomer mixture was stored at 12 C for periods up to 14 months. The effects of resin aging at this temperature on the chemical composition of the resin monomer mixture and the imidized polymer formed on curing were investigated. Aging the resin monomer mixture has the effect of partially advancing the imidization reaction. The average size of the cured polymer increases slightly with resin age. S.L.

N82-22364# Royal Aircraft Establishment, Farnborough (England).

IS GLASS FIBRE DANGEROUS TO HANDLE?

Esquevin Oct. 1981 21 p refs Transl. into ENGLISH from Plastiques Renforces Fibers de Verre Textile (France), v. 7, 1980 p 8-15
(RAE-Trans-2071; BR82945) Avail: NTIS HC A02/MF A01

A review is given of the potential hazards of working with glass fibers. Minor irritations to skin and eyes occur and can be complicated by chemical effects due to fiber surface finishes. More serious hazards could be associated with respirable fibers less than 3 microns in diameter, and the most dangerous fibers are less than 0.25 micron in diameter and greater than 10 microns in length. However, unlike asbestos fibers which split parallel to their length, glass fibers break transversely and form less dangerous particles. Epidemiological studies and experiments with animals indicate that glass fibers are relatively safe but synergistic effects due to fibers and chemical are potentially hazardous and recommendations are made on improvements to working conditions. Author

N82-22365*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

AN EVALUATION OF GREASE TYPE BALL BEARING LUBRICANTS OPERATING IN VARIOUS ENVIRONMENTS Status Report No. 6

E. L. McMurtrey Mar. 1982 24 p refs
(NASA-TM-82469; NAS 1.15:82469) Avail: NTIS HC A02/MF A01 CSCL 11H

Because many future spacecraft or space stations will require mechanisms to operate for long periods of time in environments which are adverse to most bearing lubricants, a series of tests were conducted to evaluate 38 grease-type lubricants in R-4 size bearings in five different environments for a 1 year period. Four repetitions of each test were made to provide statistical samples. These tests were also used to select four lubricants for 5 year tests in selected environments with five repetitions of each test for statistical samples. To date, in both the 1 year and 5 year tests, the best results in all environments were obtained with a high viscosity index perfluoroalkylpolyether (PFPE) grease. Author

N82-22366*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECTS OF ENVIRONMENT ON MICROHARDNESS OF MAGNESIUM OXIDE

Hiroyuki Ishigaki (Osaka Univ.) and Donald H. Buckley Apr. 1982 11 p refs
(NASA-TP-2002; E-916; NAS 1.60:2002) Avail: NTIS HC A02/MF A01 CSCL 11B

Micro-Vickers hardness measurements of magnesium oxide single crystals were conducted in various environments. These environments included air, nitrogen gas, water, mineral oil with or without various additives, and aqueous solutions with various pH values. Indentations were made on the (100) plane with the diagonals of the indentation in the (100) direction. The results indicate that a sulfur containing additve in mineral oil increased hardness, a chlorine containing additive in mineral oil decreased hardness, and aqueous solutions of hydrogen chloride decreased hardness. Other environments were found to have little effect on hardness. Mechanically polished surfaces showed larger indentation creep than did as-cleaved surfaces. Author

N82-22367# National Building Research Inst., Pretoria (South Africa).

THE USE OF PETALITE TO LIMIT THERMAL EXPANSION IN CERAMIC BODIES

D. vonEisenhart 1980 17 p refs
(CSIR-BOU-54; ISBN-0-7988-2029-2) Avail: NTIS HC A02/MF A01

The effect of petalite additions on the thermal expansion behavior of ceramic bodies is investigated. The behavior of bodies which are most easily formed by adding petalite to clays or kaolin is illustrated. Clays with a low quartz content are used for producing bodies with low thermal expansions. Depending on requirements, the petalite content must be at least 40 percent while the optimum amount is about 60 percent. These percentages of petalite correspond to Li2O contents of 1,6 percent to 2,4 percent. The extent to which the thermal expansion is reduced depends on the firing temperatures used and, also, on the nature of the plastic components in the body. A reduction in the thermal expansion of ceramic bodies is achieved by using a lithium compound such as petalite together with other materials. the alkaline earths are particular suitable for this purpose, whereas feldspar has no noticeable effect. The amount of petalite in a body is reduced effectively by replacing some of it with talc to achieve similar results. Relatively good stability during firing is expected from bodies containing petalite and talc because their vitrification ranges appear to be adequate for practical purposes. S.L.

N82-22368# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.

A STUDY OF THE ABILITY OF ORGANIC COMPOUNDS TO PENETRATE POLYMERS [STUDIE AV POLYMERMATERIALS GENOMSLAEPPLIGHET FOER ORGANISKA FOERENINGAR]

Allan Linnarson and Kjell Halvarson Jun. 1981 24 p refs In SWEDISH

(FOA-C-20414-H2) Avail: NTIS HC A02/MF A01

Polymer membranes were tested with a number of organic solvents, hardeners and epoxies. The membranes were tested with pure components as well as in mixture. Tests were conducted using apparatus attached to a mass spectrometer. The polymer membranes are not homogeneous but have microscopic cracks and pores which contribute to inconsistent results. Further tests showed that the total pressure variation across the membrane does not influence the determination of the time lag. The tests confirmed previously obtained results that penetration is influenced by a mixture's composition. A component in its pure form can have difficulty penetrating a membrane but readily penetrates a mixture. The component with the fastest penetration time will control the penetration time for the mixture. N.W.

N82-22369# Rolls-Royce Ltd., Derby (England).

RESEARCH REGARDING THE INFLUENCE OF THE STRUCTURE OF CERAMIC SHELL MOULDS ON THE DIRECTIONAL SOLIDIFICATION OF INTERNALLY COOLED TURBINE BLADES European Concerted action COST 50. Materials for Gas Turbines Final Report

Adolf Donner Mar. 1981 50 p refs Transl. into ENGLISH from a Rept. from Thyssen Giesserei AG (West Germany) In ENGLISH and GERMAN

(PNR-90090; Trans-15609/TLT-00821) Copyright. Avail: NTIS HC A03/MF A01

The chemical resistance and mechanical properties of Si-free and low SiO2 ceramic shell molds, used in the directional solidification of turbine blades, were investigated. Wax models of aircraft turbine rotor blades and nozzle guide vanes were used to represent cluster assemblies. Predominantly Al2O3 slurries were produced from sieved fractions of Al2O3 powder suspended in colloidal SiO2 for fillers. Stuccoing was done by gravity sanding systems. Dewaxing was carried out in a steam autoclave and by the flash fire method. The dewaxed molds were baked at up to 1700 C. The mold and Al2O3 crucible were superheated and directional solidification was initiated. Specimens were examined under electron microscope and by corundum blasting and etching. Shell strength is improved by reducing Si content. The tendency of SiO2 shells to SiO2 reduction by the melt is countered by the development of Al2O3 shell molds. Satisfactory nozzle guide vanes can be produced.

Author (ESA)

N82-22370# Rolls-Royce Ltd., Derby (England).

INFLUENCE OF THE FINISHES AND MORPHOLOGY OF GLASS FIBRES ON THE PROPERTIES OF REINFORCED THERMOPLASTICS

G. L. Semeghini 1981 61 p refs Transl. into ENGLISH from a Rept. from VITROFIL S.p.A. (Milan) In ENGLISH and ITALIAN Presented at 3rd Natl. Congr. on Composite Mater., Milan, 11-13 May 1978

(PNR-90092; Trans-15781/TLT-00832) Copyright. Avail: NTIS HC A04/MF A01

The surface chemicophysical factors and the physicomechanical and geometric parameters responsible for the behavior of reinforced polymers with a thermoplastic matrix are reviewed. The mechanical properties of a glass fiber reinforced thermoplastic depend on the characterisrics at the interface of the components and on the aspect ratio of the fibers, the critical value of which is determined by the resistance to shear stress at the interface. The validity of the procedures used in the forecasting or indirect measurement of surface and interface tension (and therefore thermodynamic adhesion work), can be assessed by directly measuring the interface or surface tension of polymers in the melted state at various temperatures and extrapolating the values at the ambient temperature. Diameter distribution, fiber length and shear stress factor are the basic factors for interpreting the short and long term behavior of a reinforced product under stress. Author (ESA)

N82-22371# National Physical Lab., Teddington (England). Div. of Materials Application.

FACTORS CONCERNING THE USE OF GLASS REINFORCED PLASTICS (GRP) IN CORROSIVE ENVIRONMENTS

J. M. Sillwood Jan. 1982 22 p refs

(NPL-DMA(B)20; ISSN-0143-7313) Avail: NTIS HC A02/MF A01

Areas where glass reinforced plastic (GRP) is competing with conventional metal materials in corrosive environments are reviewed and its relative merits and disadvantages are discussed. The effects of environment on the components of a GRP composite, i.e., matrix, fiber and interface, are described in relation to long term strength. Such plastics are used in minesweepers, submarines, for cladding panels in the construction industry, in the automobile industry, for solar panels, and in the chemical industry. Its main advantages are its good strength to weight ratio and corrosion resistance. Its disadvantages include brittleness, fire risks, and problems of adhesion to other components. Microdamage can increase the rate of water penetration. Chemical reaction of water with the resin can produce irreversible damage either from direct attack on the polymer network or through osmosis. Resin swelling can produce radial stresses which accelerate debonding. Plastization of the matrix leads to a decrease in mechanical stiffness and a lowering of glass transition temperature. Author (ESA)

N82-22372# Lafarge Refractaires, Trappes (France). Lab. des Ceramiques.

ZIRCONIUM: FEASIBILITY OF A HIGHLY THERMOMECHANICALLY STABLE CERAMIC [UNE NOUVELLE CERAMIQUE A HAUTES PERFORMANCES THERMOMECANIQUES]

J. P. Torre and G. Rancoule Dec. 1980 14 p refs In FRENCH

(CEC-022-5590) Avail: NTIS HC A02/MF A01

Research into physical chemical problems, posed by the fabrication of zirconium ceramics and by their use under severe thermomechanical stress, is surveyed. Progress in zirconium crystal chemistry in conjunction with developments in fracture mechanics are discussed. Considerable improvement in the fracture strength of zirconium materials is noted, especially resistance to thermal shock. Scientific and technological results indicate that zirconium has good potential in the search for less fragile ceramics. Author (ESA)

N82-22373# Swansea Tribology Centre (England).

MOLYBDENUM DISULPHIDE LUBRICATION: A CONTINUATION SURVEY Progress Report, 1979-80

A. R. Lansdown 1981 91 p refs

(Contract ESTEC-2261/74)

(Rept-81/459; ESA-CR(P)-1518) Avail: NTIS HC A05/MF A01

The history of molybdenum disulfide as a lubricant is traced and its use alone, in bulk solids, in oils, and in greases is outlined. Its chemical and physical properties are described. Corrosion resistance of molybdenum disulfide-containing substances, quality control, and performance testing are discussed. The effect of coatings and lubricants on thread friction is tabulated. The use of the related dichalcogenides tungsten disulfide is reviewed. Bonded films containing molybdenum disulfide are covered.

Author (ESA)

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N82-22374# Wisconsin Agri-Energy Corp., Meguon.

FEASIBILITY STUDY 20-MM GAL/YR FUEL GRADE ETHANOL FACILITY

Jun. 1981 141 p refs

(Contract DE-FG07-80RA-50392)

(DE82-002606; DOE/RA-50392/T1) Avail: NTIS HC A07/MF A01

Results of a preliminary process design and economic study of 20MM US gallons per year fuel grade anhydrous ethanol plant and an associated coal fired cogeneration facility are presented. The process was based on the use of No. 2 US yellow corn as the feedstock and a Wyoming low sulfur coal as the fuel. Distillers dried grains will be recovered as a by-product

of the process. It is projected that approximately 80,000 tons of distillers dried grains will be recovered per year. The cogeneration portion will use 115,000 tons of coal a year to produce 115,000 pounds per hour of process steam while at the same time generating 13,300 kilowatts of electricity. The capital cost is estimated to be $87,504,000. Assessment of the environmental, health, safety, and socioeconomic impacts show that no significant adverse impacts are anticipated in conjunction with either facility construction or operation. Two air quality considerations require further study. DOE

N82-22375# Pace Co. Consultants and Engineers, Inc., Denver, Colo.
CORN TO ETHANOL PLANT FEASIBILITY STUDY
Feb. 1981 507 p Prepared for Grand American, Inc., Yuma, Colo.
(Contract DE-FG07-80RA-50311)
(DE82-000029; DOE/RA-50311/T1) Avail: NTIS HC A22/MF A01

The technical and economic feasibility of a corn to fuel grade ethanol plant in Colorado was assessed. The results indicate that the Grand American project is commercially viable both from an economic and technical standpoint. The results of the economic and risk analysis show a 32.7 percent rate of return based on present state and federal fuel tax exemption legislation. The plant design is based on Raphael Katzen technology which has been used for several years in existing ethanol facilities. Pace does not foresee any technical problems with the facility. Markets for the ethanol appear to be the least secure aspect of the project at this point, although demand is expected to sufficiently increase to provide ample markets. The byproduct market for the dried distillers grains appears to be supply limited. Raw materials for plant operation, including corn, power, water, and coal are readily available. DOE

N82-22376# Schaffer (F. C.) and Associates, Inc., Baton Rouge, La.
TECHNICAL/ECONOMICAL FEASIBILITY STUDY FOR THE APEX OIL COMPANY ALCOHOL/GASOHOL PLANT NEAR CARVILLE, LOUISIANA
Jan. 1981 305 p refs Prepared in cooperation with URS Engineers and EMPCO, Inc.
(Contract DE-FG07-80RA-50336)
(DE82-002615; DOE/RA-50336/T1) Avail: NTIS HC A14/MF A01

The feasibility of constructing and operating a 33 million gallon-per-year ethanol plant in Carville, Louisiana was studied. Under current market the plant under consideration does not appear to be attractive at this time. Five major factors contributed to this outcome: (1) the market for ethanol/gasohol is not developed to the point where there is sufficient demand to assure full plant utilization; (2) the price required to provide a reasonable rate of return is 80 cents per barrel above the current estimated market clearing price of $1.50 per gallon; (3) the capital costs to construct a plant of this size has increased; (4) there is insufficient local feedstock production to meet the minimum import requirements; and (5) lack of participation by major oil companies in the gasohol program limits both the distribution and potential retail outlets for the product. The project was placed on hold pending satisfactory resolution of these items. DOE

N82-22377# American Farmers' Marketing Cooperative, Mayfield, Ky. Ethanol Div.
FEASIBILITY STUDY FOR ALTERNATIVE FUELS PRODUCTION BIOMASS TECHNOLOGY. VOLUME 2: ADDENDUM, ECONOMIC AND FINANCIAL ANALYSIS
8 Jan. 1981 76 p 2 Vol.
(Contract DE-FG07-80RA-50333)
(DE82-000026; DOE/RA-50333/T1-Vol-2) Avail: NTIS HC A05/MF A01

The economic and technical feasibility of constructing and operating a 10,500,000 gallon per year ethanol fuel plant near Mayfield, Kentucky was investigated. The capital cost and investment budget; source and use of funds; petroleum and ethanol markets; corn market; distillers dried grains market; competition; government regulations; and risk factors are discussed. DOE

N82-22378# National Grain Corp., Walnut Creek, Calif.
FEASIBILITY STUDY FOR 400,000 GAL/DAY ETHANOL PLANT AT BENICIA, CALIFORNIA, VOLUME 1
Jul. 1981 387 p Prepared in cooperation with Western Concentrates, Inc. 3 Vol.
(Contract DE-FG07-80RA-50309)
(DE82-002608; DOE/RA-50309/T1-Vol-1) Avail: NTIS HC A17/MF A01

Results of a study to investigate the feasibility of constructing a 400,000 gal/day (132 million gal/y) ethanol plant in the San Francisco Bay Area are summarized. The main objective was to determine whether and under what conditions the proposed plant could be built and operated with a prospective financial return justifying the investment. Specifically, the study set out to: define markets and prices for ethanol and all byproducts; define feedstock supplies and costs and determine utility and other raw material requirements; solve energy (fuel) supply problems and define an optimum system for generating process heat; complete a preliminary design package; define ways to minimize environmental problems and define an approach to permitting; perform and economic analysis of the plant and investigate economic sensitivities; and develop a financing and management plan for the project. DOE

N82-22379# National Grain Corp., Walnut Creek, Calif.
FEASIBILITY FOR 400,000 GAL/DAY ETHANOL PLANT AT BENICIA, CALIFORNIA. VOLUME 2. DRAWING PACKAGE
Jul. 1981 108 p Prepared in cooperation with Western Concentrates, Inc. 3 Vol.
(Contract DE-FG07-80RA-50309)
(DE82-002609; DOE/RA-50309/T1-Vol-2) Avail: NTIS HC A06/MF A01

A study was conducted to determine the feasibility of operating and constructing a 400,000 gallon-per-day ethanol plant in Benicia, California. Detailed drawings of the proposed plant are presented and evaluated. DOE

N82-22380# National Grain Corp., Walnut Creek, Calif.
FEASIBILITY STUDY FOR 400,000 GAL/DAY ETHANOL PLANT AT BENICIA, CALIFORNIA. VOLUME 3. ENVIRONMENTAL REPORT
Jul. 1981 102 p refs Prepared in cooperation with Western Concentrates, Inc. 3 Vol.
(Contract DE-FG07-80RA-50309)
(DE82-002610; DOE/RA-50309/T1-Vol-3) Avail: NTIS HC A06/MF A01

The technical and economic feasibility of constructing and operating a 400,000 gallon-per-day ethanol plant in Benicia, California was studied. The environmental effects and regulatory aspects of the project are addressed. Mitigation measures which can reduce effects to acceptable levels were assessed. The likelihood and timing of obtaining the permits and approvals necessary were evaluated and problems associated with the project were identified. DOE

N82-22381# Idaho National Engineering Lab., Idaho Falls.
GEOTHERMAL SOURCE POTENTIAL AND UTILIZATION FOR METHANE GENERATION AND ALCOHOL PRODUCTION
J. C. Austin Nov. 1981 123 p Prepared for Anderson (Boyd)
(Contract DE-AC07-76ID-01570)
(DE82-003800; EGG-2137) Avail: NTIS HC A06/MF A01

The technical and economic feasibility of integrating a geothermally heated anaerobic digester with a fuel alcohol plant and cattle feedlot was addressed. Thin stillage produced from the alcohol production process and manure collected from the cattle feedlot would be digested in anaerobic digesters to produce biogas, a mixture of methane and carbon dioxide, and residue. The energy requirements to maintain proper digester temperatures would be provided by geothermal water. The biogas produced in the digesters would be burned in a boiler to produce low pressure steam which would be used in the alcohol production process. The alcohol plant would be sized so that the distiller's grains byproduct resulting from the aocohol production would be adequate to supply the daily cattle feed requirements. A portion of the digester residue would substitute for alfalfa hay in the cattle feeding ration. The major design criterion for the

integrated facility was the production of adequate distiller's grain to supply the daily requirements of 1700 head of cattle. It was determined that, for a ration of 7 pounds of distiller's grain per head per day, a 1 million gpy alcohol facility would be required. An order of magnitude cost estimate was prepared for the proposed project, operating costs were calculated for a facility based on a corn feedstock, the economic feasibility of the proposed project was examined by calculating its simple payback, and an analysis was performed to examine the sensitivity of the project's economic viability to variations in feedstock and alcohol and distiller's grain prices. DOE

N82-22382# Engins Matra, Velizy (France).
NUMERICAL SIMULATION OF THE EXPLOSION OF CHARGES IN CYLINDRICAL OR CONICAL CASINGS OF STEEL AND OF ALUMINUM: COMPARISON WITH EXPERIMENTAL RESULTS [SIMULATION NUMERIQUE DE L'EXPLOSION DE CHARGES CYLINDRIQUES ET TRONC CONIQUES EN ACIER ET EN ALUMINIUM. COMPARAISON AVEC RESULTATS EXPERIMENTAUX]
P. Croizer 7 Feb. 1980 86 p In FRENCH
(N-40-1879-0) Avail: NTIS HC A05/MF A01

A theory of confined explosions is verified by comparison with experiment. The validity of an equation of state which characterizes the adaptive expansion of an explosive is discussed. A dynamic rupture criterion, which was determined parametrically, is also considered for the two container materials and geometries investigated. Calculation/test agreement is good for the deformation and extent of the ruptured zone. Results show that the theory adequately predicts at any instant the position and velocity of each point on the surface of an exploding substance. Author (ESA)

N82-22383# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
INVESTIGATION OF THE RISK OF DETONATION DUE TO STATIC ELECTRICITY OF ELECTRICAL PRIMER M/47B AND TIME LAG ELECTRICAL PRIMER M/51 [ELTAENDARE M/47B OCH ELTIDTAENDARE M/51 - UNDERSOEKNING AV RISK FOER TAENDNING P G A STATISK ELEKTRICITET]
Ola Listh Aug. 1981 10 p In SWEDISH
(FOA-C-20420-D1) Avail: NTIS HC A02/MF A01

A comparison of the detonation risk of two electrical primers with that of VA detonator caps is presented. The M/47B and M/51 primers were found to be more sensitive to static electricity than the VA caps, due to their lack of internal insulation. Use of the older primers only in high humidity environments is recommended, and it is advised that caution be taken that they do not come in contact with persons loaded with static electricity. The M/47B and M/51 primers were also determined to be sensitive to electromagnetic conditions, such as contact with radio and radar signals. J.D.

N82-22384# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
THE EFFICIENCY OF SLURRY PROPELLANTS IN UNDERWATER DETONATIONS [SLURRYSPRAENGAEMNENS VERKAN VID UNDERVATTENSDETONATIONER]
Staffan Berglund, Christian Fuerst, and Paul Stroem Sep. 1981 69 p refs In SWEDISH
(FOA-C-20422-D4) Avail: NTIS HC A04/MF A01

Five types of nonmilitary AFNO explosives with varying aluminum concentrations were tested and compared with the military explosives TNT, Hexotol, and Hexotonal. Charges were detonated at a depth of 21.5 m and pressure/time lapse measurements were made at four levels. The efficiency of the explosives was evaluated in terms of maximum pressure/time lapse, and impulse and energy frequency as a function of the charge distance and weight. Transl. by J.D.

N82-22385# Vereinigte Elektrizitaetswerke Westfalen A.G., Dortmund (West Germany).
CONSTRUCTION OF A 15 t/hr PROTOTYPE PLANT FOR THE VEW COAL CONVERSION PROCESS Final Report, Feb. 1981
Dietmar Deggim and Robert Karger Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 71 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-216; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 12,20

A 15t/hr prototype power plant was built in order to demonstrate the constructibility and operational efficiency of the VEW coal conversion process, after more than 5 years successful operation of a 1t/hr pilot plant. The prototype plant has a stone coal throughput of 15t/hr. It includes the most important units of the VEW coal conversion process, i.e., gasification unit, gas cleaning unit, and steam and power generation units. The gasification unit performs the operations: coal milling and drying, gasification and waste heat recovery, air preheating and gas cokes separation. The gas cleaning unit performs gas cooling and dust recovery, H2S-removal, salt splitting and evaporation. The gasification and gas cleaning sections are downstream, followed by a steam boiler, where the generated products are burnt. Simultaneously produced steam is processed in a steam turbine. Author (ESA)

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N82-22386*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ULTRASONIC SCANNING SYSTEM FOR IMAGING FLAW GROWTH IN COMPOSITES
Louis J. Kiraly and Erwin H. Meyn 1982 18 p Presented at 28th Intern. Instrumentation Symp., Las Vegas, Nev., 3-6 May 1982; sponsored by Instrument Soc. of Am.
(NASA-TM-82799; E-1138; NAS 1.15:82799) Avail: NTIS HC A02/MF A01 CSCL 11D

A system for measuring and visually representing damage in composite specimens while they are being loaded was demonstrated. It uses a hobbiest grade microcomputer system to control data taking and image processing. The system scans operator selected regions of the specimen while it is under load in a tensile test machine and measures internal damage by the attenuation of a 2.5 MHz ultrasonic beam passed through the specimen. The microcomputer dynamically controls the position of ultrasonic transducers mounted on a two axis motor driven carriage. As many as 65,536 samples can be taken and filed on a floppy disk system in less than four minutes. S.L.

N82-22387*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MORPHOLOGICAL AND FRICTIONAL BEHAVIOR OF SPUTTERED MoS2 FILMS
T. Spalvins 1982 18 p refs Presented at Intern. Conf. on Met. Coatings, San Diego, Calif., 4-9 Apr. 1982; sponsored by Am. Vacuum Soc.
(NASA-TM-82809; E-1150; NAS 1.15:82809) Avail: NTIS HC A02/MF A01 CSCL 11F

From the texture and growth patterns of sputtered MoS2 films deposited on substrates, three regions are distinguished: (1) a ridge formation region; (2) an equiaxed transition zone; and (3) a columnar-fiber-like structure. The lubricating properties of sputtered MoS2 films are visually identified with respect to optical changes before and after rubbing. The orientation of the surface microcrystallites is identified, and the change in optical properties is explained. In sliding contact the sputtered film tends to break up at the base of the columnar region. Effective lubrication occurs with the film remaining on the substrate. This film is 0.18 to 0.22 microns thick. J.M.S.

N82-22388*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A HIGH SPEED IMPLEMENTATION OF THE RANDOM DECREMENT ALGORITHM
Louis J. Kiraly 1982 13 p refs Presented at 1982 Aerospace/Test Measurement Symp., Las Vegas, Nev., 2-6 May 1982; sponsored by Instrument Soc. of Am.
(NASA-TM-82853; E-1192; NAS 1.15:82853) Avail: NTIS

HC A02/MF A01 CSCL 09B

The algorithm is useful for measuring net system damping levels in stochastic processes and for the development of equivalent linearized system response models. The algorithm works by summing together all subrecords which occur after predefined threshold level is crossed. The random decrement signature is normally developed by scanning stored data and adding subrecords together. The high speed implementation of the random decrement algorithm exploits the digital character of sampled data and uses fixed record lengths of 2(n) samples to greatly speed up the process. The contributions to the random decrement signature of each data point was calculated only once and in the same sequence as the data were taken. A hardware implementation of the algorithm using random logic is diagrammed and the process is shown to be limited only by the record size and the threshold crossing frequency of the sampled data. With a hardware cycle time of 200 ns and 1024 point signature, a threshold crossing frequency of 5000 Hertz can be processed and a stably averaged signature presented in real time. T.M.

N82-22389# Idaho National Engineering Lab., Idaho Falls.
ELECTROMELT FURNACE EVALUATION
G. A. Reimann and J. M. Welch Sep. 1981 24 p refs
(Contract DE-AC07-76ID-01570)
(DE82-003777; EGG-FM-5556) Avail: NTIS HC A02/MF A01

An electromelt furnace was designed, built and operated at the Idaho National Engineering Laboratory to demonstrate the suitability of this equipment for large-scale processing of radioactive wastes in iron-enriched basalt. Several typical waste compositions were melted and cast. The furnace was disassembled and the components evaluated. Calcines and fluorides attacked the furnace lining, unoxidized metals accumulated under the slag, and electrode attrition was high. DOE

N82-22390# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
[ACTIVITIES REPORT OF THE RADIO LABORATORY] Annual Report, 1978
Martti Tiuri, ed. 1979 32 p refs
(Rept-S-116; ISBN-951-751-906-0) Avail: NTIS HC A03/MF A01

Work on electromagnetic theory and techniques, microwave applications, radio astronomy, millimeter wave propagation, circuit theory, and computer aided design is summarized. Printed circuit grid antennas, and wire antenna coupling impedances were studied. Remote sensing projects included radiometer development and brightness temperature measurements from peat lands. Author (ESA)

N82-22391# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
[ACTIVITIES REPORT OF THE RADIO LABORATORY] Annual Report, 1979
Martti Tiuri, ed. 1980 30 p refs
(Rept-S-119; ISBN-951-752-180-4) Avail: NTIS HC A03/MF A01

Work on electromagnetic theory and techniques, microwave applications, radio astronomy, millimeter wave propagation, circuit theory, and computer aided design is summarized. Printed circuit antennas, sea ice characteristics at ultrahigh frequencies, microwave emission from snow, microwave radiometer oil slick detection, and medical applications of microwaves are discussed. Atmospheric attenuation at 12GHz was studied. Author (ESA)

N82-22392# Transportation Research Board, Washington, D.C.
PAVEMENT MANAGEMENT AND REHABILITATION OF PORTLAND CEMENT CONCRETE PAVEMENTS
Charles V. Zegeer, Kenneth R. Agent, Rolands L. Rizenbergs, P. C. Curtayne, T. Scullion, R. Daryl Pedigo, W. Ronald Hudson, Freddy L. Roberts, M. A. Karan, Ralph Haas et al 1981 79 p refs
(PB82-131384; TRB/TRR-814; ISBN-0-309-03255-5; ISSN-0361-1981; LC-81-18882) Avail: NTIS HC A05/MF A01; HC also available from Transportation Research Board, 2102 Constitution Ave., NW, Washington, D.C. 20418 CSCL 13B

Pavement management and rehabilitation projects and techniques are discussed. The following topics are discussed: economic analyses and dynamic programming in resurfacing project selection; implementation of an urban pavement management system; pavement performance modeling for pavement management; illustration of pavement management: from data inventory to priority analysis; rehabilitation of concrete pavements by using portland cement concrete overlays; pavement management study: Illinois tollway pavement overlays; resurfacing of plain jointed-concrete pavements; design procedure for premium composite pavement; model study of anchored pavement; prestressed concrete overlay at O'Hare International Airport: in-service evaluation; and, bonded portland cement concrete resurfacing. GRA

N82-22393# International Business Services, Inc., Washington, D.C.
INVESTIGATING THE RELATIONSHIP BETWEEN LAND USE PLANNING, TRANSPORTATION AND ENERGY CONSUMPTION Final Report
B. Burgwald, W. Cole, and C. Wagner Jan. 1981 143 p refs
(Contract DTOS59-80-C-0060)
(PB82-122185; DOT/P-10-81-90) Avail: NTIS HC A07/MF A01 CSCL 13B

The relationship among land use, transportation accessibility and energy consumption in and urban context was investigated. The issues addressed include: (1) how transportation accessibility and land use planning interact for increased energy conservation; (2) the role the public sector plays with regard to incorporating and integrating transportation, land use and energy conservation; and (3) the institutional and/or technical barriers for better integration of energy, transportation and land use considerations. GRA

N82-22394# Pennsylvania Dept. of Transportation, Harrisburg. Office of Research and Special Studies.
PAVEMENT BASE DRAIN EVALUATION Final Report
Gary L. Hoffman Jun. 1981 62 p
(PB82-120973; FHWA-PA-RD-78-5; HPR-78-6) Avail: NTIS HC A04/MF A01 CSCL 13B

Portions of a highway drainage system design was revised. Essentially, the longitudinal drainage trench was moved closer to the pavement/shoulder joint, and the fine concrete sand layer was eliminated as a trench backfill material. The specified backfill material is a coarser crushed aggregate (pea gravel). An evaluation of the effects of these changes on pavement performance is given and the new pavement base drain system is compared to the older pipe foundation underdrain system at the same site. GRA

N82-23148# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
STATUS OF COMPUTER AIDED DESIGN/COMPUTER AIDED MANUFACTURING (CAD/CAM) APPLICATIONS IN THE INDUSTRY [STAND DER CAD/CAM-ANWENDUNGEN IN DER INDUSTRIE]
Harald Walter and Volkmar Antl *In its* Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 15p In GERMAN Presented at VDMA-Symp. Analaesslich der Ausstellung SYSTEMS, Munich, 19-23 Oct. 1981 (For primary document see N82-23137 13-99)
(MBB-Z-4-81-OE) Avail: NTIS HC A09/MF A01

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N82-22395 British Broadcasting Corp., Kingswood (England). Engineering Div.
AN EXTENDED PAL SYSTEM FOR HIGH-QUALITY TELEVISION
A. Oliphant Dec. 1981 12 p refs
(BBC-RD-1981/11) Avail: BBC, Kingswood Warren, Tadsworth,

Surrey, Engl.

An extended PAL system is described which virtually eliminates cross color and gives improved luminance resolution for high quality receivers while retaining compatibility with conventional PAL decoders. The system uses the extra bandwidth available in a satellite or cable transmission channel to transmit the high frequency part of the luminance signal outside the normal video band. Tests are described which have shown that the wider-bandwidth extended PAL signal can be passed through a 27 MHz F.M. channel as foreseen for direct broadcasting from satellites, without causing noticeable distortions. Subject to the availability of high definition displays, it would give domestic viewers considerable improvement in picture quality with an acceptable small penalty in signal-to-noise ratio. Author.

N82-22396 British Broadcasting Corp., Kingswood (England). Engineering Div.

PLANNING STANDARDS FOR VHF AND UHF RECEIVING AERIAL DISCRIMINATION AND HEIGHT GAINS AT DOMESTIC RECEIVING LOCATIONS

C. P. Bell Dec. 1981 14 p refs

(BBC-RD-1981/13) Avail: BBC, Kingswood Warren, Tadsworth, Surrey, Engl.

Planning standards for receiving aerial directivity protection at VHF and UHF as a function of azimuth angle between wanted and interfering transmitters are discussed. These standards apply to cases where the wanted and interfering transmissions have the same polarizations. Values are specified for the protection obtainable if wanted and interfering transmissions are orthogonally polarized. In order to assess in practical circumstance the combined effect of directivity and polarization discrimination, a limited series of measurements were carried out in urban and surburban receiving locations. Receiving aerial height gains from 3 m to 1 m a.g.l. are dependent upon the length of the propagation path, values for path lengths greater than 100 km being only half these for paths less than 50 km in length. Measurements carried out to test the veracity of this assumption are described. S.L.

N82-22397 Royal Signals and Radar Establishment, Malvern (England).

AN ANNOTATED BIBLIOGRAPHY OF CONGESTION CONTROL IN PACKET-SWITCHED COMMUNICATIONS NETWORKS

D. P. Taylor Nov. 1981 48 p

(RSRE-81011; BR81771) Copyright. Avail: Issuing Activity

Papers on flow control, buffer allocation, deadlock prevention, traffic flow, routing, and the topological aspects of nonmilitary communication networks are reviewed. Author (ESA)

N82-22398*# Ohio State Univ., Columbus. Dept. of Electrical Engineering.

GTD ANALYSIS OF AIRBORNE ANTENNAS RADIATING IN THE PRESENCE OF LOSSY DIELECTRIC LAYERS Semiannual Report

R. G. Rojas-Teran and W. D. Burnside Aug. 1981 113 p refs

(Grant NsG-1498)

(NASA-CR-168770; NAS 1.26:168770; ESL-710964-8) Avail: NTIS HC A06/MF A01 CSCL 20N

The patterns of monopole or aperture antennas mounted on a perfectly conducting convex surface radiating in the presence of a dielectric or metal plate are computed. The geometrical theory of diffraction is used to analyze the radiating system and extended here to include diffraction by flat dielectric slabs. Modified edge diffraction coefficients valid for wedges whose walls are lossy or lossless thin dielectric or perfectly conducting plates are developed. The width of the dielectric plates cannot exceed a quarter of a wavelength in free space, and the interior angle of the wedge is assumed to be close to 0 deg or 180 deg. Systematic methods for computing the individual components of the total high frequency field are discussed. The accuracy of the solutions is demonstrated by comparisons with measured results, where a 2 lambda by 4 lambda prolate spheroid is used as the convex surface. A jump or kink appears in the calculated pattern when higher order terms that are important are not included in the final solution. The most immediate application of the results presented here is in the modelling of structures such as aircraft which are composed of nonmetallic parts that play a significant role in the pattern. S.L.

N82-22399*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

LEGAL EDUCATION AT SEA VIA ATS-1. AN EVALUATION OF THE T/S GOLDEN BEAR EXPERIMENT

Mary M. Connors Mar. 1982 14 p refs

(NASA-TM-81342; A-8800; NAS 1.15:81342) Avail: NTIS HC A02/MF A01 CSCL 17B

A course in maritime law was provided via ATS satellite to law students onboard ship. Classes were received while the ship was on the open seas and in the various ports visited. A half duplex audio channel provided the primary communication mode. All participants judged this pilot study to be extremely useful. Students were able to pursue their course work and to have the benefits of research guidance from academic advisors, while gaining practical, hands on experience at sea. S.L.

N82-22400*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

AN ANALYSIS OF RADIO INTERFEROMETRY WITH THE BLOCK O SYSTEM

J. B. Thomas 15 Dec. 1981 123 p refs

(Contract NAS7-100)

(NASA-CR-168815; JPL-Pub-81-49; NAS 1.26:168815) Avail: NTIS HC A06/MF A01 CSCL 20N

The form and flow of information from signal reception to recorded bits at each station, through cross-correlation, phase-tracking, phase calibration, and bandwidth synthesis, to final observable formation are traced. In this process the data volume is greatly compressed for each observation, from approx. 10 to the 9th power bits on the station tapes to only four final observables: amplitude, delay, phase-delay rate and RF phase. After phase calibration and propagation media calibrations, the final delay observable is shown to be the sum of a geometric delay and a clock synchronization offset. Author

N82-22401*# Ohio State Univ., Columbus. ElectroScience Lab.

EFFECTS OF ATMOSPHERIC TURBULENCE ON MICROWAVE AND MILLIMETER WAVE SATELLITE COMMUNICATIONS SYSTEMS Progress Report

D. M. J. Devasirvatham and D. B. Hodge May 1981 230 p refs

(Contract NASw-3393)

(NASA-CR-168766; NAS 1.26:168766; ESL-712759-6) Avail: NTIS HC A11/MF A01 CSCL 17B

A model of the microwave and millimeter wave link in the presence of atmospheric turbulence is presented with emphasis on satellite communications systems. The analysis is based on standard methods of statistical theory. The results are directly usable by the design engineer. J.M.S.

N82-22402# Marconi Co. Ltd., Chelmsford (England).

PHASE A STUDY OF EARTH RESOURCES; SYNTHETIC APERTURE RADAR: EXECUTIVE SUMMARY Final Report

L. M. Ericsson (MBB, Munich) Oct. 1978 82 p Prepared in cooperation with MBB, and EMI Electron. Ltd.

(Contract ESA-3524/78/F-GC(SC))

(MTR-78/100; ESA-CR(P)-1224) Avail: NTIS HC A05/MF A01

The results of a feasibility study for synthetic apeture radars to be carried on a European remote sensing satellite are summarized. The soil moisture radar sweeps a swath on the round 100 km wide. The natural beamwidth is enhanced in range and azimuth dimensions to obtain a resolution of 30 m using a slotted waveguide antenna. Specifications are given for an advanced radar and the data link from ground to satellite. The advanced radar will have a resolution of 30 m by 30 m using a double curvature reflector. Author (ESA)

N82-22403# Royal Signals and Radar Establishment, Malvern (England).

LECTURE NOTES ON DATA COMMUNICATIONS

J. M. Penley Jul. 1981 43 p refs

(RSRE-MEMO-3383) Copyright. Avail: NTIS

HC A03/MF A01

These notes give a broad summary of digital data communications ranging from digital transmission techniques to data networks and the role of communications in command and control systems. The main emphasis is to indicate the 'library' of techniques available to a communications engineer and to provide a selection of references for more detailed treatment of each subject. J.M.S.

N82-22404# Engins Matra, Velizy (France).
NUMERICAL FILTERING [FILTRAGE NUMERIQUE]
Melle Toye 11 Jun. 1981 20 p In FRENCH
(DEL/430) Avail: NTIS HC A02/MF A01

The numerical filtering of a current which serves to apply a compensating torque on a gyroscope so as to return it to the zero position is studied. The current signal is overlayed with purely sinusoidal parasitic noise, generated by rotation of the gyroscope. The noise is filtered, providing a signal appropriate for navigational calculations. The signal spectra are analyzed and the sampling frequency is chosen so as to satisfy the Shannon theorem. A FIR filter is compared with a recursive filter, based on bilinear transformation. The recursive filter gives the best resuls and its application through a 9900 microprocessor is demonstrated. Author (ESA)

N82-22405# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
ADAPTIVE PASSIVE HYDROPHONE SYSTEMS [ADAPTIVA PASSIVA HYDROFONSYSTEM]
Lars Goetherstroem, Bengt Granath, and Viggo Westerlin Jul. 1981 104 p refs In SWEDISH
(FOA-C-30165-E1) Avail: NTIS HC A06/MF A01

The foundation of adaptive signal processing in a passive hydrophone system is discussed and different criteria for adaptation is reviewed. Features of the system such as signal disturbance and array gain are shown and various calculation methods are studied. A.R.H.

N82-22406# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
INVESTIGATIONS ON WAVE PROPAGATION BY THE SPORADIC E LAYER [UNDERSOEKNING AV VAAGUTBREDNING VIA SPORADISKA E-SKIRT]
Mats Broems May 1981 48 p refs In SWEDISH
(FOA-C-30214-E2) Avail: NTIS HC A03/MF A01

Measurements of transmission via sporadic E layers on a line from Kiruna to Stockholm are presented and compared with measurements made at Lycksele situated about 100 km from the center of the line. The maximum transmitted frequency (ESMOF) is given in the form of median graphs for each month during the period. The median frequency is about 10 MHz and the upper limit, due to the range of the measuring instrument, was about 14 MHz. Transl. by A.R.H.

N82-22407# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
TWO-COLOR TELEVISION SENSOR WITH CODED COLOR DISPLAY [2-FAARGS TV-SENSOR MED KODAD FAARGPRESENTATION]
Carl Hugo Aagren Mar. 1981 14 p refs In SWEDISH Original contains color illustrations
(FOA-C-30216-E1) Avail: NTIS HC A02/MF A01

Principles for coded TV observations are discussed, as well as a description of the construction of the TV system, problems, and experiences. The technique was adapted for observation of artificial green colored objects against background vegetation. The report explains results and suggests potential uses. N.W.

N82-22408# Fondazione Ugo Bordoni, Rome (Italy).
TERRESTRIAL MOBILE RADIO SERVICES [SERVIZI RADIOMOBILI TERRESTRI]
1981 132 p refs Party in ITALIAN and FRENCH Proc. of Conf. held at Pontecchio Marconi, Italy, 2-3 Jul. 1981; cosponsored with Fondazione Guglielmo Marconi
(FUB-6-1981) Avail: NTIS HC A01/MF A01

The Italian situation regarding the 1979 Geneva Conference, and the planning of the expansion of the existing mobile radio systems are discussed. The technical developments that may improve either the quality or the capacity of the Italian networks are treated. For individual titles, see N82-22409 through N82-22419.

N82-22409# Istituto Superiore delle Poste e delle Telecomunicazioni, Rome (Italy). Direzione Centrale Servizi Radioelettrici.
FREQUENCY BANDS FOR TERRESTRIAL MOBILE RADIO SERVICES: FREQUENCY ASSIGNMENTS IN ITALY [BANDE DI FREQUENZA PER I SERVIZI RADIOMOBILI TERRESTRI-ATTRIBUZIONO ATTUALI: SITUAZIONE DELLE ATTRIBUZIONI IN ITALIA]
A. Dellovo *In* Fond. Ugo Bordoni Terrest. Mobile Radio Serv. 1981 p 5-12 Partly in ITALIAN and FRENCH (For primary document see N82-22408 13-32)
Avail: NTIS HC A01/MF A01

The frequencies assigned by existing regulations are discussed and referred to the 1979 Geneva conference definitions. The problem of frequency assignment priorities, according to the service category qualification, and the consequences of the 1979 conference for mobile services were examined. The conference provisions in the 154 to 230 MHz and 420 to 470 MHz bands are compared with the 1976 Italian frequency assignment plan, using the 156 to 174 MHz and 435 to 470 MHz bands. Author (ESA)

N82-22410# Istituto Superiore delle Poste e delle Telecomunicazioni, Rome (Italy). Radio Lab.
AN AUTOMATIC MEASUREMENT SYSTEM FOR CONTROLLING THE EQUIPMENT CHARACTERISTICS OF TERRESTRIAL MOBILE RADIO SERVICES [I SISTEMI DI MISURA AUTOMATIZZATI PER IL CONTROLLO DELLE CARATTERISTICHE DEGLI APPARATI RADIOELECTRICI DA IMPIEGARE NEL SERVIZIO RADIOMOBILE]
G. Valentino *In* Fond. Ugo Bordoni Terrest. Mobile Radio Serv. 1981 p 13-22 refs In ITALIAN (For primary document see N82-22408 13-32)
Avail: NTIS HC A01/MF A01

The system utilizes a desktop computer and is implemented in three main blocks: the control system, the measurement instrument set, and the peripheral devices set. A bidirectional data bus is employed to interrelate the functional blocks. The prototype central unit has a memory capacity of 64 kbytes with external memories of up to 1,2 Mbytes. The instrument set measures the characteristics of transmitter receivers from 10 KHz to 1 GHz. The system is especially suited for large series equipment production control and maintenance. Author (ESA)

N82-22411# Istituto Superiore delle Poste e delle Telecomunicazioni, Rome (Italy). Direzione Centrale Servizi Radioelettrici.
STATUS OF THE PRIVATELY OWNED MOBILE RADIO SERVICES IN ITALY: USER CATEGORIES AND DEVELOPMENT PROSPECTS [STATO DEL SERVIZIO RADIOMOBILE PRIVATO IN ITALIA, TIPI DI UTENZA, RELATIVI PROBLEMI, PROSPETTIVE DI SVILUPPO]
A. DellOvo *In* Fond. Ugo Bordoni Terrest. Mobile Radio Services 1981 p 23-30 In ITALIAN (For primary document see N82-22408 13-32)
Avail: NTIS HC A07/MF A01

The private and public user categories of mobile radio equipment are listed and the available channel capacities and assigned frequency bands in Italy were examined. Capacity saturation in the 156 to 174 MHz and 450 to 470 MHz frequency bands is anticipated in the immediate future. The possibilities of reducing the VHF channel width from 25 KHz to 12,5 Hz and utilization of new channels in the 900 MHz band are also discussed. Author (ESA)

N82-22412# Societa Italiana per l'Esercizio Telefonico, Rome (Italy).
STATUS OF THE PUBLIC MOBILE RADIO SERVICES [STATO ATTUALE DEL SERVIZIO RADIOMOBILE PUBBLICO]
R. Failli *In* Fond. Ugo Bordoni Terrest. Mobile Radio Serv. 1981 p 31-40 refs In ITALIAN (For primary document see N82-22408 13-32)
Avail: NTIS HC A07/MF A01

The main characteristics of the Italian mobile radio services (for conversation or person recall) are presented. The Italian situation is compared with that of other countries, regarding the

number of channels in use, the frequencies assigned and the number of users. Rapid development and limited present capacity are discussed. Author (ESA)

N82-22413# Societa Italiana Telecomunicazioni Siemens S.p.A., Milan (Italy).
A DISCUSSION ON MULTIPLE ACCESS ALTERNATIVE PHILOSOPHIES AND RELATED SYSTEM ANALYSIS [CONSIDERAZIONI SULLE DIVERSE FILOSOFIE DI ACCESSO MULTIPLO E SUGLI ASPETTI SISTEMISTICI AD ESSE LEGATI]
V. Intini and A. Pegoretti *In* Fond. Ugo Bordoni Terrest. Mobile Radio Serv. 1981 p 41-49 refs In ITALIAN (For primary document see N82-22408 13-32)
Avail: NTIS HC A07/MF A01

Bidirectional call signal dedicated channels, unidirectional paging dedicated channels, variable channel call signals, and free channel call signals are discussed. The implementation of a multiple access telephonic system is described. The rural telecommunications system Italtel RTR102 uses the free channel call signal alternative. The parameters for a 6 channel, 60 users configuration are detailed. Author (ESA)

N82-22414# Instituto Technico Meucci, Rome (Italy).
MODULATION SYSTEMS WITH MINIMUM BAND APPROPRIATION [SISTEMI DI MODULAZIONE A MINIMA OCCUPAZIONE DI BANDA]
A. Cilli and A. Corazziari (Autophon Italiana) *In* Fond. Ugo Bordoni Terrest. Mobile Radio Serv. 1981 p 53-59 refs In ITALIAN (For primary document see N82-22408 13-32)
Avail: NTIS HC A07/MF A01

Single sideband transmission and narrowband (12.5 kHz) frequency modulation are compared. The operation of a transceiver in narrowband (12.5 kHz) with phase modulation is analyzed and modification of a 25 kHz bandwidth transceiver for conversion to 12.5 KHz bandwidth is detailed. Present technology is not yet sufficient for the system to be used in the communication bands reserved for mobile radio transmission, while data transmission experimental results in the presence of fading show the convenience of using FM with a 12.5 kHz bandwidth. Author (ESA)

N82-22415# Fondazione Ugo Bordoni, Rome (Italy).
RADIOTELEPHONIC NETWORKS WITH MULTIPLE REPEATERS [RETI RADIOTELEFONICHE CON PIU' RIPETITORI]
Luciano Battaglia *In its* Terrest. Mobile Radio Serv. 1981 p 61-80 In ITALIAN (For primary document see N82-22408 13-32)
Avail: NTIS HC A07/MF A01

A system using only one channel and synchronized transmission is described. This system avoids the necessity of using different frequencies for the repeaters with overlapping reception areas. The quality of the signal at any reception point is improved by the addition of the signals from several repeaters, while measures are taken to minimize the fading problem that may be produced by the phase differences among the incoming signals. Networks with both local autosynchronization and with pilot signal synchronization are described. Author (ESA)

N82-22416# Siae Microelettronica S.p.A., Milan (Italy).
MOBILE RADIO SYSTEM IN DIFFERENT UTILIZATIONS: IMPLICATIONS FOR FREQUENCY ASSIGNMENT PLANNING [SISTEMI RADIOMOBILI PER DIVERSI TIPI DI UTENZA RELATIVE IMPLICAZIONI NEL PIANO DI ASSEGNAZIONE DELLE FREQUENZE]
E. Mascetti and G. Fabbri *In* Fond. Ugo Bordoni Terrest. Mobile Radio Serv. 1981 p 81-89 In ITALIAN (For primary document see N82-22408 13-32)
Avail: NTIS HC A07/MF A01

Rationalization of the use of available radio channels is suggested. National public service networks and urban area networks are considered. The use of synchronized repeaters working in the same frequency for a given area with a 2300 to 2400 MHz band dorsal system is recommended. A multiple access system is also recommended for urban applications, using a frequency band either of 450 or 900 MHz. Author (ESA)

N82-22417# Societa Italiana per l'Esercizio Telefonico, Rome (Italy).
A SECOND GENERATION PUBLIC MOBILE RADIO SYSTEM [SISTEMA RADIOMOBILE PUBBLICO DI CONVERSAZIONE DI SECONDA GENERAZIONE]
Renzo Failli *In* Fond. Ugo Bordoni Terrest. Mobile Radio Serv. 1981 p 91-102 refs In ITALIAN (For primary document see N82-22408 13-32)
Avail: NTIS HC A07/MF A01

As the Italian mobile radio system is approaching saturation, solutions for an improved larger capacity system are presented. The structure of mobile radiocommunications in other developed countries is discussed. The subdivision of the territory into call areas, valid for 1995 previsions, is detailed. The selected frequency bands are 450 and 460 MHz, each with 200 channels of 25 KHz bandwidth, of which four are reserved for call signals. The system can provide service to 8000 users in each area, with a traffic density of 0.028 Erlang. Author (ESA)

N82-22418# Bologna Univ. (Italy). Ist. di Elettronica.
CODE DIVISION TECHNIQUES IN LARGE CAPACITY MOBILE RADIO COMMUNICATION SYSTEMS [TECHNICHE DI DIVISIONE DI CODICE IN SISTEMI DI RADIOCOMMUNICAZIONE CON MEZZI MOBILI A GRANDE CAPACITA]
G. Falciasecca and M. Frullone (Fondazioni Ugo Bordoni) *In* Fond. Ugo Bordoni Terrest. Mobile Radio Serv. 1981 p 103-113 refs In ITALIAN (For primary document see N82-22408 13-32)
Avail: NTIS HC A07/MF A01

The potential of spread spectrum systems (SS) is discussed and two particular configurations are compared: frequency hopping differential phase shift keying (FH-DPSK) and frequency hopping frequency shift keying (FH-FSK). The FH-FSK system uses multilevel FSK coding and presents a spectral efficiency considerably better than that of the FH-DPSK system. The bit error rate in relation to the number of simultaneous users is also better in the FSK system. The protection ratio in the SS systems is also better than in the FM systems. Author (ESA)

N82-22419# Istituto Superiore delle Poste e delle Telecomunicazioni, Rome (Italy).
TERRESTRIAL MOBILE RADIO SERVICES IN FOREIGN COUNTRIES (EEC AND OTHERS) [SERVIZI RADIOMOBILI PUBBLICI TERRESTRI NEI PRINCIPALI PAESI ESTERI (CEE E ALTRI)]
F. Cappuccini *In* Fond. Ugo Bordoni Terrest. Mobile Radio Serv. 1981 p 115-132 In ITALIAN (For primary document see N82-22408 13-32)
Avail: NTIS HC A07/MF A01

Tables comparing the main parameters, characterizing radiopaging systems in 13 countries and mobile radio conversation in 11 countries, are presented, including data on start-up year, number of users, frequency bands, areas covered, integration with other systems, and equipment characteristics. The systems which are being developed in several countries are discussed in particular. Author (ESA)

N82-22420# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Flugdatentechnik und -systeme.
ERROR RESPONSE OF DISTANCE MEASURING EQUIPMENT WITH TRAPEZOIDAL PULSES IN CASE OF MULTIPATH EFFECTS AND NOISE
Rainer Ullrich May 1981 72 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-747)
(DFVLR-FB-81-34; ESA-TT-747) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 16,10

The influence of multipath disturbances and noise on precision distance measuring equipment (PDME) for aviation, using trapezoidal pulses, was investigated. Usually DME pulses have curved edges, i.e., cosinus and cosinus squared functions. The PDME system with trapezoidal pulses combined with the delay and compare (DAC) trigger method allows for disturbed pulses to show, especially clearly, the dependence of the trigger error on pulse rise time, on the parameters of the triggering method, and on the disturbance. Since results are also valid for the cosinus-cosinus squared pulse, which is favored for PDME, the

design of the PDME pulse and the DAC trigger circuit is affected. Author (ESA)

N82-22421# Fondazione Ugo Bordoni, Rome (Italy).
A PROCEDURE FOR OPTIMIZING THE PROTECTION OF A TRANSMISSION NETWORK
Ugo Mocci and Giacomo Ravaioli Dec. 1980 41 p refs
(FUB-54-1980) Avail: NTIS HC A03/MF A01

A modularized procedure which provides heuristic solutions to optimization problems is applied to a transmission network which is considered as the union of a normal (nonrearrangeable) and a standby (rearrangeable) network. Module 1 routes requirements. Module 2 is the availability analysis of the normal network. Module 3 determines the total protection requirement in each failure condition to be met by the standby network. Module 4 is a standby optimization module in which all the rerouting flows determined in 3 are met at minimum cost. Total cost is represented as a function on the routing cost determined by changing the parameters which control the multirouting. Economically optimal solutions are obtained using a combination of protective measures. Author (ESA)

N82-22422# Fondazione Ugo Bordoni, Rome (Italy).
NORMALIZATION PROCEDURES AND PREDICTION TECHNIQUES FOR RAIN ATTENUATION ON TERRESTRIAL AND EARTH-SPACE RADIO LINKS
Francesco Fedi Feb. 1981 8 p refs Presented at IEE Intern. Conf. on Antennas and Propagation, York, England, Apr. 1981
(FUB-5-1981) Avail: NTIS HC A02/MF A01

A normalization procedure which makes use of the increasing amount of data on rainfall intensity and rain attenuation for terrestrial and Earth-space links is proposed. A simple technique for predicting rain attenuation statistics is described. The technique requires the knowledge of a single meteorological parameter (point rainfall intensity exceeded for 0.01% of an average year) which identifies geographical areas of interest. More work is required to refine the normalization procedure and to validate the general applicability of the prediction technique both to terrestrial and Earth-space links. Author (ESA)

N82-22423# Fondazione Ugo Bordoni, Rome (Italy).
THE RESEARCH ACTIVITIES OF THE UGO BORDONI FOUNDATION OVER THE LAST FIVE YEARS [L'ATTIVITA DI RICERCA SVOLTA DALLA FONDAZIONE UGO BORDONI NELL'ULTIMO QUINQUENNIO]
Renato Koch, Foster Bianchi, Benedetto Daino, Francesco Fedi, Giovanni Timperi, and Francesco Valdoni Jun. 1981 130 p refs In ITALIAN
(FUB-8-1981) Avail: NTIS HC A07/MF A01

Research in applied electronics is reported. The main sectors of activity are radiocommunication systems (microwaves in particular), cable communication, digital systems, automatic communication, management and control systems, and laser and optoelectronic systems. Author (ESA)

N82-22424# Fondazione Ugo Bordoni, Rome (Italy).
TRANSMISSION QUALITY TESTS OF TELEPHONIC CIRCUITS WHICH INCLUDE A LINK SERVED BY THE SIRIO COMMUNICATIONS SATELLITE [PROVE DI QUALITA' DI TRASMISSIONE EFFETTUATE SU COLLEGAMENTI TELEFONICI COMPRENDENTI UNA TRATTA SERVITA DAL SATELLITE PER TELECOMUNICAZIONI SIRIO]
Foster Bianchi, Andrea Paolini, and Antonio Vincenti (Ist. Superiore delle Poste e delle Telecomunicazioni) Jul. 1981 35 p In ITALIAN
(FUB-10-1981) Avail: NTIS HC A03/MF A01

Tests were carried out using 12 circuit configurations and subjective transmission quality evaluation. Noise was injected at levels from -50db to -20db in laboratory tests in order to obtain reference levels for the subjective evaluation. The tested circuit configurations included a terrestrial line, the insertion of echo cancellers and of echo suppressors. The tests were repeated, interchanging the individuals which transmitted and received. Noise equivalent levels of about -20db were registered when no anti-echo device was used, while -30db were obtained, using echo suppressors, and -35db, using echo cancellers. Author (ESA)

N82-22425# Southampton Univ. (England). Inst. of Sound and Vibration Research.
A CRITICAL ASSESSMENT OF DETERMINISTIC AND STATISTICAL TECHNIQUES FOR THE DYNAMIC IDENTIFICATION OF STRUCTURAL SYSTEMS USING A FAST SWEPT SINUSOIDAL TEST SIGNAL
M. J. Lowrey Sep. 1981 59 p refs
(ISVR-TR-118) Avail: NTIS HC A04/MF A01

Results in frequency and time domains for the dynamic identification of a structural system, using rapid frequency sweep testing, are compared. Fourier analysis, autocorrelation, and cross correlation techniques are considered. Resonant frequencies and damping loss factors are compared quantitavely by applying a least squares curve fitting technique to the mobility data. Accuracy is assessed by comparing, for a simulated shock loading condition, the actual time domain response with that predicted by convolution, using the respective mathematical models. Reliability is compared through tests carried out in the presence of additive noise. For noise-free conditions, the direct Fourier transform method offers advantages of computational efficiency and overall accuracy relative to the cross correlation technique, assuming white-noise input. In simulated noisy environments, best results are achieved using the cross spectral density method, while contamination is greatest with the deterministic procedure. Author (ESA)

N82-22426# Research Inst. of National Defence, Linkoeping (Sweden).
DIGITAL RADIO LINK: PERFORMANCE DURING MULTIPATH FADING [DIGITAL RADIOLAENK: FOERBINDELSEKVALITET VID FLERVAEGSUTBREDNING]
Charlie Yeh Dec. 1981 34 p refs In SWEDISH
(FOA-C-30253-E2) Avail: NTIS HC A03/MF A01

Selective fading which seems to be the primary cause of propagation blackout was analyzed with a simple two paths model, consisting of one direct component and one reflected/refracted component. A rough estimate of the maximum time lag of the specular component was obtained. A propagation blackout model based on the critical pair values of time lag and amplitude of the reflected component is presented. The model takes into account the landforms and the geometry of the reflecting layers. Results show that blackout depends on hoplength to a power of 6. The maximum time lag for link distances not over 90 km is lower than 10 nsec. Author (ESA)

N82-22427# IBM France S. A., Paris.
INTRA-ENTERPRISE TELECOMMUNICATION SATELLITES
A. J. Henry 5 Nov. 1981 19 p Presented at Telecom Conf., Cologne, 4-6 Nov. 1981
Avail: NTIS HC A02/MF A01

Information transfer in the mid 1980's is sketched. The use of geostationary satellites for internal requirements of businesses is an important factor in the growth of information transfer. Protection of transferred information is achieved through encryption. The companies which use satellites are those whose telecommunication costs are already significant; who have large computing capabilities including distributed data processing; who use national and international leased circuits; and whose establishments are dispersed. Uses include teleconferencing, voice and data transmission, and text and facsimile communication. Author (ESA)

N82-22428# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Hochfrequenztechnik.
SIGNIFICANCE AND REPRESENTATION OF THE POLARIZATION OF ELECTROMAGNETIC WAVES
Volker Stein Sep. 1981 68 p refs In GERMAN; ENGLISH summary
(DFVLR-Mitt-81-30) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 16

The significance of the polarization which is characteristic of an electromagnetic wave is demonstrated by a series of simple examples taken from several fields of application. The basic mathematical and geometrical methods for the representation of the polarization are presented. The mathematical method describes the Stokes vectors. The geometrical description is based on the polarization ellipse, the Poincare polarization cone, the polarization

chart and the polarization sphere. The polarization can be shown as a stereographic projection of the complex polarization behavior. Author (ESA)

N82-22429# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Hochfrequenztechnik.

THEORY AND INTERPRETATION OF THE POLARIZATION OF SCATTERED ELECTROMAGNETIC WAVES

Volker Stein Sep. 1981 78 p refs In GERMAN; ENGLISH summary

(DFVLR-Mitt-81-31) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 17

The scattering behavior of electromagnetic waves is formulated by scattering matrices and reflection matrices. The mathematical characteristics of these matrices are investigated and physically interpreted. For a variety of symmetric and unsymmetric simply structured objects the scattering and equivalent reflection matrix are presented. Complete description of a scattering process requires knowledge of the Stokes reflection matrix. Measurement of maximum and null polarizations provides, for the case of a single object, scattering and reflection matrices in an invariant form. The reflection matrix elements for dispersed as well as for single objects gives valuable information about the scattering object, such as orientation, symmetry and coarse structure. The reflection matrix supplies determination criteria concerning the number of independent scattering objects. Author (ESA)

N82-22430# European Space Agency, Paris (France).

PROSPECTS OF SATELLITE COMMUNICATIONS FOR MOBILES: TOWARDS A GLOBAL MOBILE SPACE SEGMENT

C. Rosetti Nov. 1981 18 p Presented at Amalfi Colloq., Italy, 1981

Avail: NTIS HC A02/MF A01

Terrestrial, maritime, and air transportation applications of communications satellites are considered. Communicating with long distance trucks can be achieved by text transmission which is cheaper than voice links, avoids access problems, and uses the frequency spectrum more efficiently. The need to accept fast and slow air traffic in the same air space, especially near airports, creates safety problems that can be overcome by equipping aircraft with a satellite controlled display device, showing traffic in the vicinity. The maritime satellite service is characterized by low market penetration that can be improved by cutting equipment costs, e.g., by decreasing ship antenna performance and using high gain satellite antennas, producing narrow beams. Author (ESA)

N82-22431# AEG-Telefunken, Ulm (West Germany). Forschungsinst.

SPEECH INPUT AND OUTPUT Final Report, Apr. 1981

Fritz Class, Helmut Mangold, David Stall, and Rainer Zelinski Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 110 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-DV-81-009; ISSN-0170-9011) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 23,10

Possibilities for acoustical dialogs with electronic data processing equipment were investigated. Speech recognition is posed as recognizing word groups. An economical, multistage classifier for word string segmentation is presented and its reliability in dealing with continuous speech (problems of temporal normalization and context) is discussed. Speech synthesis is considered in terms of German linguistics and phonetics. Preprocessing algorithms for total synthesis of written texts were developed. A macrolanguage, MUSTER, is used to implement this processing in an acoustic data information system (ADES). Author (ESA)

N82-22432# AEG-Telefunken, Ulm (West Germany). Geschaeftsbereich Hochfrequenztechnik.

MYRIA WIRELESS COMMUNICATION. PART 1: SYSTEM ANALYSIS OF THE PRACTICABILITY OF WIRELESS INFORMATION TRANSMISSION IN MINES BY ELECTROMAGNETIC ELF WAVES Final Report, Aug. 1979

Horst Scheffner, Dieter Heinz, and Klaus F. Jochum (Ruhrkohle AG) Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 311 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-81-223; ISSN-0340-7608) Avail: NTIS HC A14/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 47,30

The feasibility of through-the-ground mine communications was studied theoretically. Experimental results obtained with a prototype mine communication and monitoring system were then analyzed. Calculations of ELF propagation in dissipative media were compared with measurements made in the Ruhr district. The waveform generator station and two mobile receiving sets are described. Magnetic field strength is computed as a function of range; different parameters for several antenna designs are used. A magnetic dipole buried inside a homogeneous medium as well as in stratified media, a loop antenna, and a wire antenna are characterized for noise and frequency response. Communication is possible, using frequencies below 300 Hz. Author (ESA)

N82-22433# Heinrich-Hertz-Institut fuer Schwingungsforschung, Berlin (East Germany).

TWO-WAY CABLE TELEVISION PROJECT Final Report, Sep. 1981

Henning Wilkens, Peter Guenther, Fritz Kiel, Franz Kraus, Peter Mahnkopf, and Rolf Schnee Bonn Bundesministerium fuer Forschung und Technologie Feb. 1982 190 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie Original contains color illustrations

(BMFT-FB-T-82-011; ISSN-0340-7608) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 34,50

The market demand for a multiuser computer system with interactive services was studied. Mean system work load at peak use hours was estimated and the complexity of dialog with a central computer was determined. Man machine communication by broadband cable television transmission, using digital techniques, was assumed. The end to end system is described. It is user friendly, able to handle 10,000 subscribers, and provides color television display. The central computer system architecture with remote audiovisual terminals is depicted and software is explained. Signal transmission requirements are dealt with. International availability of the test system, including sample programs, is indicated. Author (ESA)

N82-22434# Science Research Council, Chilton (England).

NUMERICAL SOLUTION OF ELECTROMAGNETIC FIELD PROBLEMS IN TWO AND THREE DIMENSIONS

C. W. Trowbridge 1981 31 p refs

(PB82-131228; RL-81-075) Copyright. Avail: NTIS HC A03/MF A01 CSCL 20C

The interaction of electric and magnetic fields provides many examples of coupled problems which are solved by the finite element method. Static and low frequency problems using the differential operator approach are emphasized. The status of computation for 2D fields is discussed. The use of scalar potentials for 3D static fields for economy is emphasized, and the importance of selecting potential types carefully to minimize numerical cancellation errors is also discussed. Some formulations for the vector 3D field problem for eddy current fields were derived with analytic and experimental field measurement comparisons. Results using software packages built at RAL are presented to illustrate the methods. T.M.

N82-23114*# Houston Univ., Tex. Tracking and Communications Development Div.

EFFECTS OF RAIN AND FOG ON THE SHUTTLE KU-BAND MICROWAVE SCANNING BEAM LANDING SYSTEM RANGE AND ACCURACY PERFORMANCE

Dennis Butler *In its* The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 33 p refs (For primary document see N82-23108 13-99)

Avail: NTIS HC A14/MF A01 CSCL 17B

N82-23117*# Houston Univ., Tex.

INVESTIGATION OF A SOLID STATE POWER COMBINING ANTENNA PROPOSED FOR USE IN THE SOLAR POWER

SATELLITE
Larry A. Farmer (Kansas Technical Inst.) *In its* The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 28 p refs (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 10A

N82-23147# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
CALCULATION AND ANALYSIS OF RECTANGULAR CORRUGATED HORN PATTERNS [BERECHNUNG UND AUSLEGUNG VON RECHTECK-RILLENHORNSTRAHLERN]
Dietmar Fasold and Helge Pecher *In its* Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 7 p refs In GERMAN (For primary document see N82-23137 13-99)
(MBB-UR-518-81-OE) Avail: NTIS HC A09/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N82-22435 British Broadcasting Corp., Kingswood (England). Engineering Div.
PIEZOELECTRIC PLASTIC TRANSDUCERS: A FEASIBILITY STUDY
M. A. Parker Dec. 1981 17 p refs
(BBC-RD-1981/12) Avail: BBC, Kingswood Warren, Tadsworth, Surrey, England

The properties of certain piezoelectric plastics are outlined and these are used to postulate transducer designs. The characteristics of two types of dome radiation which were made from these materials are discussed in detail. While these transducers were able to produce subjectively reasonable sound levels when incorporated in a loudspeaker system, they proved to be considerably less sensitive than their moving coil counterparts. They were also prone to violent resonance modes which proved difficult to dump. The ability of piezoelectric transducers to reproduce very high frequencies at high levels and without serious directional problems may recommend their use for acoustic scale modeling. Author

N82-22436*# Rockwell International Corp., Anaheim, Calif. Science Center.
DESIGN, PRODUCTION, AND TESTING OF FIELD EFFECT TRANSISTORS Final Report
N. Sclar Feb. 1982 84 p ref
(Contract NAS2-10920)
(NASA-CR-166321; NAS 1.26:166321) Avail: NTIS HC A05/MF A01 CSCL 09A

Cryogenic MOSFETS (CRYOFETS), specifically designed for low temperature preamplifier application with infrared extrinsic detectors were produced and comparatively tested with p-channel MOSFETs under matched conditions. The CRYOFETs exhibit lower voltage thresholds, high source-follower gains at lower bias voltage, and lower dc offset source voltage. The noise of the CRYOFET is found to be 2 to 4 times greater than the MOSFET with a correspondingly lower figure of merit (which is established for source-follower amplifiers). The device power dissipation at a gain of 0.98 is some two orders of magnitude lower than for the MOSFET. Further, CRYOFETs are free of low temperature I vs V character hysteresis and balky conduction turn-on effects and operate effectively in the 2.4 to 20 K range. These devices have promise for use on long term duration sensor missions and for on-focal-plane signal processing at low temperatures. Author

N82-22437*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CONTROL SYSTEM FOR AN INDUCTION MOTOR WITH ENERGY RECOVERY Patent Application
Frank J. Nola, inventor (to NASA) Filed 19 Feb. 1982 22 p (NASA-Case-MFS-25477-1; US-Patent-Appl-SN-350472) Avail: NTIS HC A02/MF A01 CSCL 09A

A control circuit for an induction motor powered system is described wherein a power factor controlled servo loop is used to control, via the phase angle of firing of a triac, the power input to the motor as a function of load placed on the motor by machinery of the powered system. Upon application of torque by this machinery to the motor, which tends to overspeed the motor, the firing angle of the triac is automatically set to a fixed, and relatively short, firing angle. NASA

N82-22438*# Duke Univ., Durham, N. C. Dept. of Electrical Engineering.
ANALYSIS OF TRANSISTOR AND SNUBBER TURN-OFF DYNAMICS IN HIGH-FREQUENCY HIGH-VOLTAGE HIGH-POWER CONVERTERS
Paul M. Wilson, Thomas G. Wilson, and Harry A. Owen, Jr. [1982] 6 p refs
(Grant NsG-3157)
(NASA-CR-168760; NAS 1.26:168760) Avail: NTIS HC A02/MF A01 CSCL 09C

Dc to dc converters which operate reliably and efficiently at switching frequencies high enough to effect substantial reductions in the size and weight of converter energy storage elements are studied. A two winding current or voltage stepup (buck boost) dc-to-dc converter power stage submodule designed to operate in the 2.5-kW range, with an input voltage range of 110 to 180 V dc, and an output voltage of 250 V dc is emphasized. In order to assess the limitations of present day component and circuit technologies, a design goal switching frequency of 10 kHz was maintained. The converter design requirements represent a unique combination of high frequency, high voltage, and high power operation. The turn off dynamics of the primary circuit power switching transistor and its associated turn off snubber circuitry are investigated. S.L.

N82-22439*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THREE-DIMENSIONAL RELATIVISTIC FIELD-ELECTRON INTERACTION IN A MULTICAVITY HIGH-POWER KLYSTRON. 1: BASIC THEORY
Henry G. Kosmahl Apr. 1982 33 p refs Presented at the Intern. Electron Devices Meeting, Washington, D.C., 11 Oct. 1971; sponsored by IEEE; and the Solar Power Space System Workshop, Houston, Tex., 15-18 Jan. 1979; sponsored by NASA
(NASA-TP-1992; E-1017; NAS 1.60:1992) Avail: NTIS HC A03/MF A01 CSCL 09A

A theoretical investigation of three dimensional relativistic klystron action is described. The relativistic axisymmetric equations of motion are derived from the time-dependent Lagrangian function for a charged particle in electromagnetic fields. An analytical expression of the fringing RF electric and magnetic fields within and in the vicinity of the interaction gap and the space-charge forces between axially and radially elastic deformable rings of charges are both included in the formulation. This makes an accurate computation of electron motion through the tunnel of the cavities and the drift tube spaces possible. Method of analysis is based on Lagrangian formulation. Bunching is computed using a disk model of electron stream in which the electron stream is divided into axisymmetric disks of equal charge and each disk is assumed to consist of a number of concentric rings of equal charges. The Individual representative groups of electrons are followed through the interaction gaps and drift tube spaces. Induced currents and voltages in interacting cavities are calculated by invoking the Shockley-Ramo theorem. B.W.

N82-22440# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
EFFECTS OF SECONDARY ELECTRON EMISSION ON CHARGING
M. S. Leung, M. B. Tueling, and E. R. Schnauss 30 Jul. 1981 33 p refs
(Contract N04701-80-C-0081)
(TOR-0081(6470-02)-2) Avail: NTIS HC A03/MF A01

Laboratory charging studies using two electron sources with different energies show that the charging behaviors of typical spacecraft thermal control dielectric surfaces are extremely sensitive to the shape of their secondary emission curves. The

results also suggest that the electron spectrum in a natural charging environment can be separated into three distinct regions (noninteracting, discharging, and charging) depending on the kinetic energy of the incident electron relative to the charged surface and on the secondary emission characteristics of the material. To a first order approximation, the relative number of electrons in these different regions determines the potential of the charged surface. Measurements of the secondary electron emission characteristics of Kapton are described and the effects of bulk conductivity and secondary emission on surface charging of such materials are discussed. A.R.H.

N82-22441# United Technologies Corp., South Windsor, Conn.
Ac/dc POWER CONVERTER FOR BATTERIES AND FUEL CELLS Final Report
R. W. Rosati, C. V. Banic, F. J. Kornbrust, J. L. Peterson, and B. R. Will Sep. 1981 231 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 841-1)
(DE82-900867; EPRI-EM-2031) Avail: NTIS HC A11/MF A01

The results of a program to design an advanced power converter for use in battery energy storage and fuel cell generation systems in the 1980s are presented. The design analysis, including each major subsystem and component, various ways of optimizing a 14-MW wide-range converter, and the requirements for some of the converter components are described. An assessment of the basic program is included, and a number of future program needs are identified. M.D.K.

N82-22442# Texas Univ., Arlington. Energy Systems Research Center.
EFFECTS OF REDUCED VOLTAGE ON THE OPERATION AND EFFICIENCY OF ELECTRIC LOADS. VOLUME 2: APPENDIXES Final Report
M. S. Chen, R. R. Shoults, and J. Fitzer Sep. 1981 244 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 1419-1)
(DE82-900984; EPRI-EL-2036-Vol-2) Avail: NTIS HC A11/MF A01

The efficiency of important power system loads as a function of voltage was studied. A quantification of the energy consumption of electric load components as function of supply voltage and a means for predicting energy changes as a function of voltage at the circuit level are discussed. A variety of loads were tested at seven input voltages. At each voltage level, equipment was required to provide identical outputs where appropriate. Detailed test specifications were prepared for each load component including the appropriate dependent and independent parameters to be monitored during the tests. Air conditioning equipment, heating equipment, and distributions transformers were tested by outside subcontractors because these items required highly specialized and elaborate test facilities. Test specifications and procedures are included. Utilizing the results gathered thus far, a methodology was proposed to estimate distribution system efficiency as it relates to the operating voltage level. M.D.K.

N82-22443# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. de Recherches sur la Fusion Controlee.
CURRENT SHARING IN AN INSULATED MULTISTRAND CABLE IN TRANSIENT AND STEADY STATE CURRENT CONDITIONS
D. Faivre and B. Turck Oct. 1980 4 p refs Presented at the Appl. Superconductivity Conf., Santa Fe, N. Mex., 29 Sep. - 2 Oct. 1980
(CEA-CONF-5468; CONF-800980-53) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

In a cable made of insulated strands, the current distribution is fundamentally different in transient and steady state conditions. During a current sweep, the current is redistributed as a function of the flux linked by each strand. Linear theory based on the knowledge of all the self and mutual inductances between strands determines the current in each strand. In a cable supplied with a dc current, only the lattice of parallel and series resistances plays a role in assigning the currents. In an actual cable the current in a strand is a function of the resistance of the transfer length region near the current leads. An experiment with a six strand cable indicates that the transfer length resistance is well balanced and large enough to equalize the currents within 10%. When a normal zone appears that does affect only one strand, the currents in the neighboring strands increase by almost 50%, value in agreement with the calculations. They remain at that level for a time duration depending on the transverse conductance, which can be extremely long. DOE

N82-22444# Westinghouse Research and Development Center, Pittsburgh, Pa.
MATERIALS RESEARCH FOR HYDROGEN-COOLED SUPERCONDUCTING POWER TRANSMISSION LINES Quarterly Report, 1 Jan. - 31 Mar. 1981
A. M. Sletten, A. I. Braginski, M. Rosado, and J. R. gavaler 1981 18 p refs
(Contract DE-AC04-79ET-29354)
(DE82-002170; DOE/ET-29354/T2; QR-5) Avail: NTIS HC A02/MF A01

Dielectric breakdown and loss measurements in liquid hydrogen and liquid hydrogen impregnated synthetic dielectrics, at temperatures between 14 and 200K and at hydrostatic pressures up to 5 atmospheres are performed. Effects of dissolved impurities/additives in the liquid are included. The self field and low field superconducting properties of high critical temperature materials are characterized at temperatures between approximately 14 and 200K. The experiments on dielectrics were conducted outdoors, due to safety considerations. The Design of the auxiliary equipment for the tests on the dielectric properties of LH2 was finished, and all the key components were ordered. A safety analysis report was started to discuss the effect of the setting on the safety aspects of this project; the design of the system of small electrodes was modified to provide individual ground connections for each ground electrode; data on Tc vs. composition was obtained for several samples of carbon doped V3Si; and the Nb3 Ge chemical vapor deposition apparatus was reactivated. DOE

N82-22445# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. de Physique du Plasma et de la Fusion Controlee.
ENERGETIC BREAKDOWNS AND VOLTAGE HOLD-OFF BETWEEN COPPER ELECTRODES IN VACUUM
F. Bottiglioni and J. P. Bussac Oct. 1980 43 p refs
(EUR-CEA-FC-1052) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository libraries

In high power neutral beam injections, used for thermonuclear reactor, very high ion currents are extracted from large area ion sources, using an assembly of three or four extraction grids. The extraction system must be very reliable and unaffected by breakdowns that may occur between grids. The aim of the experiments described here is to infer some empirical laws allowing to dimension the ion sources grid gaps and to assess what energy in the breakdowns leads to irreversible damages. DOE

N82-22446# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
CONSTRUCTION OF A LARGE SCALE INTEGRATION CIRCUIT EQUIPPED WITH AN IR DETECTOR ARRAY AND ELECTRONIC MULTIPLEXING [KONSTRUKTION AV EN LSI-KRETS INNEHAALLANDE EN IR-DETEKTORARRAY MED ELEKTRONISK MULTIPLEXING]
Rolf Helgodt, Bjoern Nilsson, and Haakan Pettersson Sep. 1981 32 p refs In SWEDISH
(FOA-C-30232-E1) Avail: NTIS HC A03/MF A01

The design and construction of a circuit containing an array of four infrared detectors is described. The circuit is part of a MultiProject Chip built at Lindkopings Technical University. Schematics and circuit diagrams are presented. J.D.

N82-22447# Fondazione Ugo Bordoni, Rome (Italy).
SYNCHRONOUS GENERATORS STABILITY ANALYSIS
Riccardo Marino and Salvatore Nicosia (Rome Univ.) Dec. 1980 32 p refs
(FUB-53-1980) Avail: NTIS HC A03/MF A01

A direct systematic procedure for constructing Liapunov functions (V functions) for nonlinear systems involving multiple nonlinearities is proposed. A Liapunov function for a mathematical model, representing a synchronous generator connected to

an infinite bus which includes two additional damping rotor windings, flux decay effect, proper voltage regulator dynamics and velocity governor action, is deduced. The V function derived represents an extension of earlier results concerning less detailed models for the same problem. It requires fewer calculations than other methods, and is applicable to models for which trial and error is normally used. Author (ESA)

N82-22448# Research Inst. of National Defence, Linkoeping (Sweden).
CAPACITANCE TRANSIENT MEASUREMENTS OF DEEP LEVELS IN P TYPE METAL OXIDE SEMICONDUCTORS [KAPACITANSTRANSIENTMAETNINGAR AV DJUPA NIVAAER I P-TYP MOS-STRUKTURER]
Karl-Henrik Ryden Dec. 1981 52 p refs In SWEDISH
(FOA-C-30251-E1) Avail: NTIS HC A04/MF A01

Energy conditions in the band gap in p-type MOS semiconductors were investigated, centering on energy states prevailing at the silicon-silicon dioxides interface. The experiments were carried out with a deep level transient spectroscopy device. Two different states were found: a broad state distribution with a maximum concentration of 3 times 10 to the 13th power/sq cm/eV between 0.3 and 0.4 eV over the valence band edge in As-oxidized samples (after metallization and heating over 400 C for 30 min, this state, which is located on the very surface, disappears); and a single energy level at Ev + 0.35 eV that does not disappear after heating at temperatures under 450 C for 30 min. Measurements show that this level exists not only at the interface, but even deeper in the bulk material.
Author (ESA)

N82-22449# Valvo G.m.b.H., Hamburg (West Germany).
DEVELOPMENT OF FAST ANALOG-DIGITAL INTERFACE CIRCUITS IN NMOS TECHNOLOGY Final Report, Oct. 1980
Peter Draheim and Walter Demmer Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 99 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-212; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21

Interface circuits with geometries on the order of 4 micrometers were developed, using a NMOS method. These circuits include track and hold circuits, comparators, and differential amplifiers. Analog to digital as well as digital to analog converters were designed. A high speed 6 bit parallel analog to digital converter in NMOS and an 8 bit digital to analog converter were realized for video signal applications (6 MHz bandwidth). It is shown that both converters have a conversion rate higher than 25 MHz. Author (ESA)

N82-22450# Engins Matra, Velizy (France).
REPORT ON MONOCHIPS [RAPPORT SUR LES MONOCHIPS]
Gilles Lefebvre 25 Nov. 1981 24 p In FRENCH
(DEL-GL-683) Avail: NTIS HC A02/MF A01

The integration of microcomputer memory and peripheral functions into a single package central processing, is presented. Two classes of devices are assessed: (1) the Motorola 6805 and Intel 8021 which have parallel input/output gates, a timer, and limited RAM and ROM, and (2) the 6801 and 8051 which have more memory, a series of interfaces, and more powerful programming possibilities. The first class is designed for simple applications. The architecture, starting with a basic model, provides for extension (silicon surface and addressing). The second class is applicable as, a personal computer and provides an intelligent operating system for peripherals. Programming capabilities of both classes are summarized schematically. Author (ESA)

N82-22451# Physical Research Lab., Ahmedabad (India).
IMAGE INTENSIFYING SYSTEM FOR LOW LIGHT LEVEL SIGNAL DETECTION
A. K. Datta 1981 13 p refs
(PB82-121617; PRL/TN-81-03) Avail: NTIS HC A02/MF A01 CSCL 09E

An image intensifying system was developed. The photomultiplier photocathode is cooled passively by liquid nitrogen, to improve its detection sensitivity at low light level. It can operate continuously for several hours. Two types of systems were developed; one for cooling the end window, transmission type photocathode and another, for the side window, reflectance type photocathode. The system reduces the cathode dark current by a factor of about 1,000,000 in case of S 1 type of photocathode. GRA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N82-22452 Illinois Univ. at Urbana-Champaign.
PARTICLE-TRACKING STUDIES FOR SOLIDS MOTION IN A GAS FLUIDIZED BED Ph.D. Thesis
Jengshyan Lin 1981 194 p
Avail: Univ. Microfilms Order No. 8127632

The mean velocity distributions of solids, ranging from 0.42 and 0.8 mm, fluidized by air flows, ranging from 1.65 to 4.6 times the minimum fluidizing velocity, are presented. It is found that the patterns of gross solids circulation are heavily dependent on the fluidizing velocity and particles size. Sample measurements of limited range of conditions were obtained for a bed with a distributor plate smaller than the bed cross section and for a bed with a spherical internal structure. In addition, several exploratory studies were also conducted. Sample results of the Lagrangian auto-correlation and turbulent shear stress of the fluctuating velocities are presented. Furthermore, by superimposing selected sets of the tracer's location data to 'synthesize' the stratified bed experiments, a picture of the solids mixing was obtained. The results suggest that they are feasible and could be valuable in furthering the understanding of fluidized bed dynamics. Dissert. Abstr.

N82-22453*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GENERATION OF INSTABILITY WAVES AT A LEADING EDGE
Marvin E. Goldstein 1982 12 p refs Proposed for presentation at the 3rd Joint Thermophys. Fluids, Plasma and Heat Transfer Conf., St. Louis, 7-11 Jun. 1982; sponsored by AIAA and ASME
(NASA-TM-82835; E-1201; NAS 1.15:82835) Avail: NTIS HC A02/MF A01 CSCL 20D

Two cases are considered. The first is concerned with mean flows of the Blasius type wherein the instabilities are represented by Tollmien-Schlichting waves. It is shown that the latter are generated fairly far downstream of the edge and are the result of a wave length reduction process that tunes the free stream disturbances to the Tollmien-Schlichting wave length. The other case is concerned with inflectional, uni-directional, transversely sheared mean flows. Such idealized flows provide a fairly good local representation to the nearly parallel flows in jets. They can support inviscid instabilities of the Kelvin-Helmholtz type. The various mathematically permissible mechanisms that can couple these instabilities to the upstream disturbances are discussed.
T.M.

N82-22454*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOLID ROCKET BOOSTER WATER IMPACT TEST
Frank Bugg Mar. 1982 23 p refs
(NASA-TM-82468; NAS 1.15:82468) Avail: NTIS HC A02/MF A01 CSCL 20D

Water impact drop tests were performed on the space shuttle solid rocket boosters (SRB). Peak water impact pressures and pressure/time traces were measured for various impact velocities using a two-dimensional, full-scale SRB aft skirt internal ring model. Passive burst disc-type pressure transducers were calibrated for use on flight SRB's. The effects on impact pressure of small ring configuration changes and application of

thermal protection system cork layers were found to be negligible. M.G.

N82-22455*# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
A NEW NUMERICAL APPROACH FOR COMPRESSIBLE VISCOUS FLOWS Final Report
J. C. Wu and S. G. Lekoudis Mar. 1982 105 p refs
(Grant NsG-3307)
(NASA-CR-168842; NAS 1.26:168842) Avail: NTIS HC A06/MF A01 CSCL 20D

A numerical approach for computing unsteady compressible viscous flows was developed. This approach offers the capability of confining the region of computation to the viscous region of the flow. The viscous region is defined as the region where the vorticity is nonnegligible and the difference in dilatation between the potential flow and the real flow around the same geometry is also nonnegligible. The method was developed and tested. Also, an application of the procedure to the solution of the steady Navier-Stokes equations for incompressible internal flows is presented. B.W.

N82-22456*# National Aeronautics and Space Administration, Washington, D. C.
THE ANALYSIS OF TURBULENT FLOW BY HOT WIRE SIGNALS Ph.D. Thesis - Physikalische Ingenieurvissenschaft der Technischen Univ., 1981
M. Bartenwerfer Apr. 1982 103 p refs Transl. into ENGLISH of German Thesis Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-76703; NAS 1.15:76703) Avail: NTIS HC A06/MF A01 CSCL 20D

When measuring velocities in turbulent gas flow, approximation signal analysis with hot wire anemometers having one and two wire probes are used. A numeric test of standard analyses shows the resulting systemmatic error increases quickly with increasing turbulent intensity. Since it also depends on the turbulence structure, it cannot be corrected. The use of such probes is thus restricted to low turbulence. By means of three wire probes (in two dimensional flows with X wire probes) in principle, instantaneous values of velocity can be determined, and an asymmetric arrangement of wires has a theoretical advantage. S.L.

N82-22457# National Aerospace Lab., Tokyo (Japan).
EFFECT OF T (PARALLEL) GREATER THAN T (PERPENDICULAR) ON ROTATIONAL DISTRIBUTION OF N2 IN Ar FREE JET
Katsuhisa Koura Dec. 1981 6 p refs In JAPANESE; ENGLISH summary
(NAL-TR-689T) Avail: NTIS HC A02/MF A01

The effect of anisotropic translational temperature T(parallel) > T(perpendicular) on the rotational distribution, temperature, and collision number of N2 in the Ar free jet is investigated at the lower density level P sub od = 15 Torr mm using the ellipsoidal velocity distribution and the rotational transition cross section of the power law. The effect of T(parallel) > T(perpendicular) is appreciable. The rotational distribution, which is a non-Boltzmann distribution with overpopulation of the higher rotational levels, and temperature for T(parallel) > T(perpendicular) = T sub i lie slightly above those for isotropic temperature T(parallel) = T(perpendicular) = T sub i (isentropic) and appreciably below those for T(parallel) = T perpendicular > T sub i. S.L.

N82-22458*# United Technologies Research Center, East Hartford, Conn.
TURBOFAN FORCED MIXER-NOZZLE INTERNAL FLOW-FIELD. VOLUME 1: A BENCHMARK EXPERIMENTAL STUDY Final Report
Robert W. Paterson Washington NASA Apr. 1982 131 p refs 3 Vol.
(Contract NAS3-20951)
(NASA-CR-3492; NAS 1.26:3492) Avail: NTIS HC A07/MF A01 CSCL 20D

An experimental investigation of the flow field within a model turbofan forced mixer nozzle is described. Velocity and thermodynamic state variable data for use in assessing the accuracy and assisting the further development of computational procedures for predicting the flow field within mixer nozzles are provided. Velocity and temperature data suggested that the nozzle mixing process was dominated by circulations (secondary flows) of a length scale on the order the lobe dimensions which were associated with strong radial velocities observed near the lobe exit plane. The 'benchmark' model mixer experiment conducted for code assessment purposes is discussed. N.W.

N82-22459*# United Technologies Research Center, East Hartford, Conn.
TURBOFAN FORCED MIXER-NOZZLE INTERNAL FLOW-FIELD. VOLUME 2: COMPUTATIONAL FLUID DYNAMIC PREDICTIONS Final Report
M. J. Werle and V. N. Vasta Washington NASA Apr. 1982 90 p refs 3 Vol.
(Contract NAS3-20951)
(NASA-CR-3493; NAS 1.26.3493) Avail: NTIS HC A05/MF A01 CSCL 20D

A general program was conducted to develop and assess a computational method for predicting the flow properties in a turbofan forced mixed duct. The detail assessment of the resulting computer code is presented. It was found that the code provided excellent predictions of the kinematics of the mixing process throughout the entire length of the mixer nozzle. The thermal mixing process between the hot core and cold fan flows was found to be well represented in the low speed portion of the flowfield. N.W.

N82-22460*# United Technologies Research Center, East Hartford, Conn.
TURBOFAN FORCED MIXER-NOZZLE INTERNAL FLOW-FIELD. VOLUME 3: A COMPUTER CODE FOR 3-D MIXING IN AXISYMMETRIC NOZZLES Final Report
J. P. Kreskovsky, W. R. Briley, and H. McDonald Washington NASA Apr. 1982 129 p refs Prepared in cooperation with Scientific Research Associated, Inc., Glastonbury, Conn. 3 Vol.
(Contract NAS3-20951)
(NASA-CR-3494; NAS 1.26:3494; R81-912929) Avail: NTIS HC A07/MF A01 CSCL 20D

A finite difference method is developed for making detailed predictions of three dimensional subsonic turbulent flow in turbofan lobe mixers. The governing equations are solved by a forward-marching solution procedure which corrects an inviscid potential flow solution for viscous and thermal effects, secondary flows, total pressure distortion and losses, internal flow blockage and pressure drop. Test calculations for a turbulent coaxial jet flow verify that the turbulence model performs satisfactorily for this relatively simple flow. Lobe mixer flows are presented for two geometries typical of current mixer design. These calculations included both hot and cold flow conditions, and both matched and mismatched Mach number and total pressure in the fan and turbine streams. N.W.

N82-22461# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
ANALYSIS OF EVOLUTIONARY ERROR IN FINITE-ELEMENT SIMULATIONS OF THE SHALLOW-WATER EQUATIONS
I. M. Navon 1981 46 p refs Presented at Conf. on Finite Element Methods in South Africa, Pretoria, 17-18 Mar. 1981
Avail: NTIS HC A03/MF A01

A Galerkin finite element model of the shallow water equations is presented. A generalized framework for analyzing its accuracy based on the Cullen-Morton theory is briefly presented. Three mass matrix schemes, the consistent mass, the lumped mass and a generalized mixed mass (GMM) scheme were used for numerical schemes, and when the same test problem was solved, to test the accuracy of the finite element models against both a refined mesh solution and a highly accurate nonlinear ADI finite difference model. The GMM scheme had the greater accuracy. Integral invariants of the shallow water equations conserved almost perfectly for long term runs. S.L.

N82-22462 Rolls-Royce Ltd., Derby (England). Theoretical Science Group.
THROUGH-FLOW CALCULATION METHODS
P. Stow 25 Mar. 1981 80 p refs Presented at Cranfield

Inst. of Tech. Short Course on Adv. Flow Calculations, England 23-27 Mar. 1981
(TSG-0027) Avail: NTIS HC A05/MF A01

The place of the through-flow calculation in the design of turbomachinery components is indicated and the interaction with other calculations in the procedure is discussed. The equations of motion for a quasi-three dimensional through-flow analysis were derived, using a passage-averaging technique. The relationship with other through-flow models is considered. The streamline curvature method of solution of these equations is presented. The radial equilibrium equation used in the method is derived and details of the numerical solution are given. Extensions to the method and the basic through-flow model, including annulus wall boundary layers and cooling flows, are treated. The matrix method, finite element and time-marching methods are mentioned and the relationships between the methods are indicated. Author (ESA)

N82-22463# California Univ., Irvine. Dept. of Mechanical Engineering.
EFFECT OF SOLID PARTICLES ON THE TURBULENT FLOW OF A ROUND GASEOUS JET, A MATHEMATICAL AND EXPERIMENTAL STUDY Quarterly Technical Progress Report, 1 May - 30 Oct. 1981
S. E. Elghobashi 30 Oct. 1981 6 p refs
(Contract DE-FG22-80PC-30303)
(DE82-002133: DOE/PC-30303/T3) Avail: NTIS HC A02/MF A01

Progress in mathematical and experimental studies aimed at modeling and measuring flow rates for the two-phase gases with dispersed particles in turbulent flows of jets is reported. Exact transport equations of mass and momentum for the two phases, the carrier fluid's kinetic energy of turbulence, and its dissipation rate were derived for incompressible two-phase flows. In the area of clear air jet measurements, attempts were made to obtain two-dimensional measurements of the clear air jet using a two-color, bragg cell shifted laser velocimeter. A complete data set for the streamwise component of mean velocity and turbulence intensity and some data for tangential velocity components were recorded and are included. These data were obtained using a recently modified software package for two-component data acquisition. The data for streamwise flow were compared with the available data for circular jet flow. The agreement was good in the inner half of the jet while some scatter was observed in the outer region of the jet. DOE

N82-22464# Gordian Associates, Inc., Washington, D. C.
HEAT PUMP DEMAND CHARACTERISTICS: A STUDY OF THE IMPACTS OF SINGLE-FAMILY RESIDENTIAL HEAT-PUMP TECHNOLOGIES ON ELECTRIC-UTILITY-SYSTEM LOADS Final Report
A. Lannus, M. Hesse, and B. Appelbaum Oct. 1981 145 p refs Sponsored by EPRI
(EPRI Proj. 1100-1)
(DE82-900861; EPRI-EA-2074) Avail: NTIS HC A07/MF A01

The hourly power demand and heating- and cooling-mode energy use of electric air source heat pumps in single-family residences was analyzed and correlated. Field data from 50 houses in five different geographical locations, representing a range of 1434 to 8310 heating degree days and 2889 to 527 cooling degree days, were selected from a previous field study. A subset of the data was used to test a residential building-heat pump simulation model. Calculated daily heating energy consumption agreed to within 10 to 27% of the measured values; daily cooling energy consumption agreed to within 12 to 23% of the measured values. A Monte Carlo simulation procedure was developed for the prediction of heat pump diversified demand based on a probability sample of residential customers selected on the basis of certain customer-class, equipment, and weather-related characteristics. Due to lack of valid field data, only a crude test of this procedure was possible, but it indicated that this method holds promise in simulations where test metering data are unavailable. DOE

N82-22465# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
INFLUENCE OF STONE WALLS ON THE EXPLOSION PROPAGATION OF AN AIR HYDROGEN MIXTURE IN AN ENCLOSED SPACE [INVERKAN AV STENFYLLNING PAA EXPLOSIONSFOERLOPPET AV EN LUFT-VAETGASBLANDNING I ETT SLUTET UTRYMME]
Henrik Almstroem and Staffan Berglund May 1981 82 p refs In SWEDISH
(FOA-C-20408-D1) Avail: NTIS HC A05/MF A01

The cushioning effect of rocks on detonations in a closed environment was investigated. In the test the pressure time elapse in six spots on a vertically oriented shock pipe 240 cm ion, 25 cm diameter were measured. Tests were conducted using five different types of stone filling. In most of the experiments, an air hydrogen mixture was used. One stone filling was tested with varying air hydrogen concentrations. The capability of the stone filling to transmit impulses to the wall of the pipe were evaluated in an experiment. The total impulses transmitted to the bottom area of a small pipe (70 cm in length) was measured. J.M.S.

N82-22466# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Abteilung Stroemung und Verbrennung.
MEASUREMENT OF VELOCITY DISTRIBUTION AND TURBULENCE IN A SPECIAL WIND TUNNEL USING A LASER DOPPLER VELOCIMETER
Jochen Mueller (Kloeckner-Humboldt-Deutz AG), Jens-Carsten Petersen, Erich Pilz, and Herbert Wiegand Jun. 1981 46 p refs In GERMAN; ENGLISH summary
(DFVLR-Mitt-81-26) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 12.35

The flow behavior in a jet mixing visualization chamber for turbulent fuel spray mixing with air under compression, e.g., at top dead center in diesel engines, was investigated with a laser Doppler velocimeter. The measurements were performed in two cuts in the profile perpendicular to the flow direction. The range of flow conditions in the measuring chamber was tested. The measurements were conducted with and without turbulence grids and shear flow grids behind the inlet nozzle. Wire grids did not enhance the turbulence in the measuring chamber. One of the tested shear flow grids produced shear flow as expected. A turbulence grid whose design was based on experimental results, produced a turbulence degree of up to 30% over the whole measuring cross section. Author (ESA)

N82-22467# Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service.
A SUMMARY OF CENTRO INFORMAZIONI STUDI ESPERIENZE'S (CISE) ACTIVITIES ON TWO PHASE FLOW
L. Brusa and C. Sandri 1981 18 p Presented at 5th Intern. Symp. on Water Column Separation, Obernach, West Germany, 28-30 Sep. 1981
(CISE-1723) Avail: NTIS HC A02/MF A01

Research into the fluid dynamics of single and two phase water flow is discussed. The definition, realization, elaboration, and analysis of thermal hydraulic plants are considered. The use of experimental test loops and special instrumentation is described. Increasingly complicated dynamic experiments necessitate sophisticated mathematical modeling. The development of relevant thermal hydraulic models and their implementation in computer codes is surveyed. Author (ESA)

N82-22468# Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service.
DATA BANK OF IN SITU TESTS PERFORMED ON THE CONDENSER COOLING CIRCUITS OF LA CASELLA THERMAL POWER PLANT (PIACENZA, ITALY)
E. Daco and E. Meregelli 1981 20 p ref Presented at 5th Intern. Symp. on Water Column Separation, Obernach, West Germany, 28-30 Sep. 1981 Sponsored by Ente Nazionale per l'Energia Eletricca
(CISE-1724) Avail: NTIS HC A02/MF A01

The data bank formed by the digitized oscillograms relevant to quantities measured during an experimental test program is described. The experimental program was to test a condenser cooling plant and investigate hydraulic phenomena occurring in the plant as a consequence of startup, pump stop, or pump trip-off operations. The computer program for data bank management is explained. The organization of the magnetic tape

on which the data bank and management program are stored is also covered. The management program listing and an example of program use are provided. Author (ESA)

N82-22469# Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht (West Germany). Inst. fuer Physik.

SOLUTION OF FLUID FLOW PROBLEMS BY A DIRECT SPLINE INTERPOLATION METHOD

J. Haeuser, D. Eppel, and F. Tanzer (Giessen Univ., West Germany) 2 Oct. 1981 24 p refs Repr. from Numerical Methods in Laminar and Turbulent Flow (Swansea, England), 1981 p 1165-1184 Presented at 2nd Intern. Conf. on Numerical Methods in Laminar and Turbulent Flow, Venice, 13-16 Jul. 1981

(GKSS-81/E/52; ISSN-0344-9629) Avail: NTIS HC A02/MF A01

A direct cubic spline procedure for the numerical approximation of first and second spatial derivatives is presented. The method uses a uniform mesh. It does not demand the solution of a system of linear equations. The spline coefficients are determined by analytical formulas, depending on the boundary values and the eigenvalues of a 2 X 2 matrix. The method is applied to the solution of the nonlinear one dimensional Burgers equation, the atmospheric boundary layer equations, and to the diffusion equation, where the medium moves at a constant and uniform velocity. Truncation error analysis shows that the formulation is fourth order accurate for the first derivative, and second order accurate for the second derivative if the first derivatives are of fourth order accuracy of boundary points. Stability analysis for the linear Burgers equation, using discrete perturbation theory, gives substantially improved values for the Courant number and the Reynolds cell number compared with the commonly employed spline formulation. Author (ESA)

N82-22470# Institut de Mecanique des Fluides de Lille (France).

INFLUENCE OF THE VELOCITY GRADIENT AND OF THE DIMENSIONS OF ORIFICES ON THE MEASUREMENT OF PARIETAL PRESSURE [INFLUENCE DU GRADIENT DE VITESSE ET DES DIMENSIONS DES ORIFICES SUR LA MESURE DE LA PRESSION PARIETALE]

C. Ducruet and A. Dyment 24 Jan. 1980 32 p refs In FRENCH

(Contract DRET-79-34.301.00.470.75.01)

(IMFL-80-03; IMFL-8230) Avail: NTIS HC A03/MF A01

An error correction method for the measurement of parietal pressure is proposed; it is based on a linearization, valid over a wide range of values for the diameter of a pressure sensor orifice. The method requires prior knowledge of the influence coefficients. Experiments were carried out in an incompressible flow, in a rectangular wind tunnel, on four dihedral angles in the presence of a laminar boundary layer. Micromanometers were used to measure pressure differences. The three parameters (boundary layer influence, velocity gradient influence, orifice depth) which govern the error are determined by similitude. The effects of boundary layer and velocity gradient are shown. The effect of orifice depth is still undecided. Author (ESA)

N82-22471# Institut de Mecanique des Fluides de Lille (France).

EXPERIMENTAL STUDY OF SONIC FLOW AROUND A PROFILE IN THE PRESENCE OF PERMEABLE WALLS [ETUDE EXPERIMENTALE D'ECOULEMENT SONIQUE AUTOUR D'UN PROFIL EN PRESENCE DE PAROIS PERMEABLES]

O. Rodriguez and P. Gryson 5 Feb. 1980 59 p In FRENCH

(Contracts DRET-78-34.217.00.480.75.01; DRET-79-34.301.00.470.75.01)

(IMFL-80-06; IMFL-8121-8231) Avail: NTIS HC A04/MF A01

The flow at free stream Mach 1 around an airfoil profile in the presence of suction through upper and lower porous walls was studied in a rectangular wind tunnel. Results were used to validate calculations relative to the simulation of flow in an infinite atmosphere. Results show good agreement between experiment and calculation; this confirms the interest of parietal suction in wind tunnel tests as the boundary layer is very important to adapted experimental magnitudes. Author (ESA)

N82-22472# Institut de Mecanique des Fluides de Lille (France).

SEPARATED FLOW AROUND CYLINDERS [ECOULEMENTS DECOLLES AUTOUR DE CYLINDRE]

A. Dyment, C. Ducruet, P. Gryson, and J. C. Pegneaux 27 Feb. 1980 72 p refs In FRENCH

(Contract DRET-79-34.301.00.470.75.01)

(IMFL-80-08; IMFL-8238) Avail: NTIS HC A04/MF A01

Unsteady properties of the near wakes of cylinders were studied for large Reynolds numbers and at transonic speeds. Tests were carried out on four cylinders in a transonic wind tunnel. Two cylinders were investigated with flows having Reynolds number between 336,000 and 483,000. Two other cylinders were observed in transonic flows with Mach number varying from 0.70 to 0.98 and Reynolds number between 100,000 and 180,000. Experiments consisted in visualizing the flow by ultrahigh speed spark shadowgraph photography. Results show that the vortex street subsists up to the highest Reynolds number tested and that the Strouhal number remains constant near 0.2. A coupling between the vortex street and the flow is maximal at critical Mach. It disappears as soon as shock waves prevent perturbations induced by unsteady motions of the vortex street from going upstream. Author (ESA)

N82-22473# Institut de Mecanique des Fluides de Lille (France).

ULTRAHIGH SPEED VISUALIZATION OF EDGE VORTICES OFF A DEFLECTED WING [VISUALIZATION ULTRA-RAPIDE DU TOURBILLON MARGINAL D'UNE AILE EN INCIDENCE]

J. P. Flodrops and A. Merlen 2 Jul. 1980 32 p refs In FRENCH

(Contract DRET-79-34.301.00.470.75.01)

(IMFL-80-30; IMFL-8233) Avail: NTIS HC A03/MF A01

The application potential of spark shadowgraph photography for the study of unsteady three dimensional flow was assessed. The edge vortex which forms in the flow around a wing of limited span, placed at an angle of incidence, was studied. Tests were carried out in a compressible subsonic flow at Mach 0.7. It is shown that the eye of the vortex can be studied by this technique. However, spark shadowgraph photography is only appropriate for detailed analysis in the case of three dimensional phenomena with simple geometry, which involve large gradients of volumetric mass. Author (ESA)

N82-22474# Institut de Mecanique des Fluides de Lille (France).

STUDY BY DOUBLE EXPOSURE HOLOGRAPHY OF THE THREE DIMENSIONAL CHARACTER OF THE FLOW AROUND AN AIRFOIL PROFILE IN A WIND TUNNEL [ETUDE PAR HOLOGRAPHIE A DOUBLE EXPOSITION DU CARACTERE TRIDIMENSIONNEL DE L'ECOULEMENT AUTOUR D'UN PROFIL D'AILE EN SOUFFLERIE]

G. Heid and M. Stanislas 3 Jul. 1980 35 p refs In FRENCH

(Contract DRET-79-34.301)

(IMFL-80-31; IMFL-8242) Avail: NTIS HC A03/MF A01

The three dimensional character of the flow around a NACA 0012 profile, placed between walls, was studied. The incidence of flow was evaluated, using holographic velocity measurements. Results are compared to values obtained with Menard's theory. The local induced incidence could not be measured. The problem lies with insufficient data for the moment of inertia of microparticles which make up the local flow. Author (ESA)

N82-22475# Institut de Mecanique des Fluides de Lille (France).

SELF-INDUCED UNSTEADY SEPARATION ON A FIXED BODY IN SUBSONIC AND TRANSONIC FLOW

A. Dyment, P. Gryson, and C. Ducruet 1980 28 p refs Presented at EUROMECH 135 on Unsteady Separation and Reversed Flow in External Fluid Dyn., Marseille, 7-9 Oct. 1980

(IMFL-8044; IMFL-0206) Avail: NTIS HC A03/MF A01

A visualization technique that shows unsteady flow properties at high speeds where compressibility effects are apparent was developed. Experiments were conducted in a continuous flow, closed circuit wind tunnel. Flow phenomena are observed at subsonic and transonic speeds on cylinders, and at Reynolds numbers between 100,000 and 500,000. A technique of multiple sparks, ultrahigh speed visualization made it possible to reconstruct the time history of the flow over one period of the vortex street. A coupling between the vortex street and the flow on the body

is shown. It reaches a maximum at critical Mach and disappears as soon as shock waves prevent perturbations induced by unsteady motions of the vortex street from going upstream. Unsteady pressures produced by the coupling are of the same order of magnitude as the mean pressure. It is demonstrated that unsteady properties have to be considered at the first approximation.
Author (ESA)

N82-22476# Rolls-Royce Ltd., Derby (England).
FLOW RESEARCH ON BLADING: THEORETICAL ANALYSIS OF TURBULENT SEPARATION AND REATTACHMENT AT THE TRAILING EDGE OF A BLADE AT SUPERSONIC SPEEDS
Pierre Carriere (ONERA, Paris) and Lang S. Dzung, ed. 1981 48 p refs Transl. into ENGLISH from Decollement de Recollement Turbulents (France), p 210-242 In ENGLISH and FRENCH Presented at Symp. on Flow Res. on Blading, Baden, Switzerland, 1969
(PNR-90104; Trans-15552/TLT-00817; T57360) Avail: NTIS HC A03/MF A01

Methods for characterizing separation conditions to determine either the safety margin before stalling, or performance deterioration which results from separation, are reviewed. A method for calculating turbulent separation using a two dimensional model is outlined. A zone of free separation is followed by an isobaric separated zone which precedes the zone of reattachment to the lower surface flow. The behavior of the fluid in the stagnation zone is ignored. Very thick boundary layers subject to expansion of sudden recompression are handled by considering the supersonic part of the boundary layer as similar to a nonviscous flow. Author (ESA)

N82-22477 Illinois Univ. at Urbana-Champaign.
THREE DIMENSIONAL FLOW WITHIN CONDUITS OF ARBITRARY GEOMETRICAL CONFIGURATIONS Ph.D. Thesis
Akira Nakayama 1981 319 p
Avail: Univ. Microfilms Order No. 8127655

A general elliptic calculation scheme was developed along with a three dimensional transformation procedure for arbitrary nonorthogonal coordinate systems, for the purpose of predicting the three dimensional turbulent flows within ducts of arbitrary geometrical configurations. After the completion of the calculations on the various test flow cases the laminar developing flows in square and triangular ducts (the laminar separated flow in a constricted circular tube as well as the fully developed turbulent flow in a square, rectangular, and trapezoidal ducts) this elliptic scheme was employed for the calculations of the three dimensional developing turbulent flows in square duct with two equation (k and epsilon) model coupled to the algebraic stress model. The predicted results were extensively compared with two sets of experimental data as well as the calculations by the parabolic marching procedure, with strong emphasis on the local structure of turbulence. Dissert. Abstr.

N82-22147# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
FINITE DIFFERENCE METHOD FOR THE INVERSE MODE COMPUTATION OF A THREE DIMENSIONAL TURBULENT BOUNDARY LAYER
M. Formery and J. Delery *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-5, Sep. - Oct. 1981 (ESA-TT-725) Feb. 1982 p 11-21 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), No. 1981-5, Sep. - Oct. 1981 (For primary document see N82-22145 13-01)
Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 45

N82-22164# Vereinigte Flugtechnische Werke-Fokker G.m.b.H., Bremen (West Germany). Abt. Dynamik/Aeroelastik.
AIRCRAFT FUEL TANK SLOSH AND VIBRATION TEST
Helmut Zimmermann *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 11 p (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

N82-22170# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.
GUNFIRE BLAST PRESSURE PREDICTIONS
R. M. Munt, A. J. Perry, and S. A. Moorse *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 20 p refs (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

N82-23129*# Texas A&M Univ., College Station.
CAPILLARY PRIMING CHARACTERISTICS OF A DUAL PASSAGE HEAT PIPE IN ZERO-G Final Report
George P. Peterson *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 50 p (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 20D

N82-23130*# Puerto Rico Univ., Rio Piedras.
ANALYSIS OF LOW-G HEAT TRANSFER FOR A CRYOGENIC OXYGEN PRESSURIZATION HEATER Final Report
Joe Rios *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 38 p refs (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 20D

N82-23131*# Norwalk State Technical Coll., Conn.
EFFECT OF SHEAR STRESS ON CELL CULTURES AND OTHER REACTOR PROBLEMS Final Report
Howard Schleier *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 19 p (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 20D

N82-23142# Vereinigte Flugtechnische Werke G.m.b.H., Bremen (West Germany).
CALCULATION OF TWO DIMENSIONAL VISCOUS FLOWS BASED ON AN INVERSE BOUNDARY LAYER SOLUTION [BERECHNUNG 2-D VISKOSER STROEMUNGEN MIT ABLOESUNG AUF DER BASIS EINER INVERSEN GRENZSCHICHTLOESUNG]
Eberhard Elsholz, Georg Dargel, and Frank Thiele (Tech. Univ., Berlin) *In* MBB Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 8 p refs In GERMAN Presented at DGLR Symp. on Stroemungen mit Abloesungen, Stuttgart, 23-24 Nov. 1981 (For primary document see N82-23137 13-99)
Avail: NTIS HC A09/MF A01

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N82-22478*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A PORTABLE, LOW-COST FLIGHT-DATA MEASUREMENT AND RECORDING SYSTEM
Robert J. Miller Mar. 1982 18 p refs
(NASA-TM-84229; A-8871; NAS 1.15:84229) Avail: NTIS HC A02/MF A01 CSCL 14E

The design of and the experience with an inexpensive, hand-portable, onboard data system used to record four parameters in the final portion of the landing approach and touchdown of an airplane are described. The system utilized a high-quality audio tape recorder and amateur photographic equipment with accessory circuitry rather than specialized instrumentation to given satisfactory results. Author

N82-22479*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.
THIN FILM TEMPERATURE SENSORS, PHASE 3
H. P. Grant, J. S. Przybyszewski, R. G. Claing, and W. L. Anderson 11 Jan. 1982 83 p refs
(Contract NAS3-22002)
(NASA-CR-165476; NAS 1.26:165476; PWA-5708-26) Avail:

NTIS HC A05/MF A01 CSCL 14B

A thin film Thermocouple system installation for engine test evaluation was designed, and an engine test plan was prepared. Film adherence, durability, accuracy, and drift characteristics were improved. Film thickness was increased to 14 microns, and drift was reduced to less than 0.02 percent of Fahrenheit temperature per hour on actual turbine blades at 1255 K. S.L.

N82-22480# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.

HYPERGOL VAPOR DETECTOR (HVD) TECHNICAL INTERCHANGE

G. L. Loper 1 Aug. 1981 83 p refs

(Contract F04701-80-C-0081)

(TOR-0081(6447)-1) Avail: NTIS HC A05/MF A01

Lower explosion limit (LEL) and threshold limit value (TLV) hydrazine-fuel vapor detectors were developed. Sensitive and specific detectors are currently desired that are capable of rapidly monitoring hydrazine, monomethylhydrazine (MMH), and unsymmetrical dimethylhydrazine (UDMH) at levels that are one-half of the TLVs established for these compounds. Information on the principle of operation of each HVD, as well as specifications on the instrument size and performance are provided. Trade-offs that exist between the cost, sensitivity and specificity, and portability of the various detectors are discussed. B.W.

N82-22481*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FRINGE LOCALIZATION REQUIREMENTS FOR THREE-DIMENSIONAL FLOW VISUALIZATION OF SHOCK WAVES IN DIFFUSE-ILLUMINATION DOUBLE-PULSE HOLOGRAPHIC INTERFEROMETRY

Arthur J. Decker Apr. 1982 45 p refs

(NASA-TP-1868; NAS 1.60:1868; E-757) Avail: NTIS HC A03/MF A01 CSCL 14E

A theory of fringe localization in rapid-double-exposure, diffuse-illumination holographic interferometry was developed. The theory was then applied to compare holographic measurements with laser anemometer measurements of shock locations in a transonic axial-flow compressor rotor. The computed fringe localization error was found to agree well with the measured localization error. It is shown how the view orientation and the curvature and positional variation of the strength of a shock wave are used to determine the localization error and to minimize it. In particular, it is suggested that the view direction not deviate from tangency at the shock surface by more than 30 degrees.

Author

N82-22482# National Physical Lab., Teddington (England). Div. of Mechanical and Optical Metrology.

EVALUATION OF A HOLOGRAPHIC TECHNIQUE FOR ASSESSING THE QUALITY OF A THERMOPLASTICS PIPE JOINT

A. E. Ennos, G. D. Dean, and G. B. Quinn Aug. 1981 19 p refs

(NPL-DMA(B)-17/MOM-53) Avail: NTIS HC A02/MF A01

A holographic technique suitable for nondestructive tests of pipe joints outside the laboratory is presented. A laser beam passes through a beam expander and is reflected by a mirror onto a photographic plate placed in front of the object. A small bright source of white light, e.g., a microscope lamp, is directed at the object from the position where the laser beam diverges. The image reflected behind the object is photographed. The fringe pattern shows how distortion changes the distance between the pipe and the photographic plate, each fringe representing 0.3/micron movement. The technique was used to measure joint distortion of plastic pipes, pressurized internally. Results, correlated with joint structure revealed by sectioning, show high precision.

Author (ESA)

N82-22483# Research Inst. of National Defence, Umea (Sweden). Huvudavdelning 3.

CONTROL OF THE INTENSIMETER RA 73 USED IN SWITZERLAND [KONTROL AV DEN I SCHWEIZ ANVAENDA INTENSIMETERN RA 73]

Thomas Ulvs and Goeran Hulten Aug. 1981 14 p In SWEDISH

(FOA-C-40138-A3) Avail: NTIS HC A02/MF A01

The intensimeter used by the Swiss and French military, the 'Control and Alarm Radiation Meter, model RA 73' was tested for accuracy under various conditions. The intensimeter has a very low energy and exposure rate dependency. The effect of humidity and temperature variation is low (less than 10 percent) while the directional dependency for low energy levels is great. The instrument has an estimated degree of error of less than + or - 20 percent. The intensimeter is small and easy to carry. Measurements are read on a logarithmic gauge which covers the instruments two ranges, 1mRh to 1000mRh. The intensimeter has two GM tubes, one for high, one for low activity. N.W.

N82-22484# Ruhr Univ., Bochum (West Germany). Astronomisches Inst.

INVESTIGATION OF THE USE OF AN ELECTRONIC SENSOR IN A SUPERWIDE FIELD CAMERA Final Report

Wolfhard Schlosser Bonn Bundesministerium fuer Forschung und Technologie Jun. 1980 55 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-W-80-001; ISSN-0170-1339) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11,80

The suitability of the Reticon RA 100 x 100 matrix detector for a superwide field camera was investigated. An optical model of this camera for checking the characteristics of Reticon and camera were developed. The production of the strongly aspherical hyperbolic mirror for the superwide field camera was difficult. The use of a numerically controlled milling machine for the production of the grinding template used to generate the desired mirror surface led to large improvements. The Reticon RA 100 x 100 was tested in the laboratory as well as on the telescope. Its use in astronomical areas is out of the question, as the high color temperatures that occur reduce the effective sensitivity too greatly. Author (ESA)

N82-22485# Kalle, Wiesbaden (West Germany).

REAL TIME RECORDING OF X RAY PICTURES WITHOUT USE OF SILVER HALIDE FILMS Final Report, Oct. 1979

Roland Moraw Bonn Bundesministerium fuer Forschung und Technologie Nov. 1981 59 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-81-202; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 12,60

Recording materials for deformation X-ray pictures were developed. In electroradiographic systems charge images are created which form deformation pictures on thermoplastic, elastic, or viscous layers. For continuous tones the deformation pictures have to be grated. On adjusted recording materials, charges of .0000000001 A/sq cm corresponding to 50 microns R X-ray exposures, were sporadically found. In ionization chambers, charges of .000000003 A/sq cm were shown with exposures to one mR. Author (ESA)

N82-22486# Centro Informazioni Studi Esperienze, Milan (Italy).

MEASUREMENT BY LASER INTERFEROMETER OF MICRODISPLACEMENTS IN PIEZOELECTRIC DEVICES UNDER ELECTRIC EXCITATION [MISURA MEDIANTE INTERFEROMETRO LASER DEI MICROSPOSTAMENTI DI ELEMENTI PIEZOELETTRICI OPPORTUNAMENTE ECCITATI]

D. Dotti (Pavia Univ., Italy), M. Famiglietti, and D. Scandolo 1981 15 p In ITALIAN Presented at 9th Conv. Nazl. dell'Assoc. Ital. per l'Anal. delle Sollecitazioni, Trieste, Italy, 23-26 Sep. 1981

(Contract ENEL-39530)

(CISE-1736) Avail: NTIS HC A02/MF A01

The electrical impedance and the most important electromechanical parameters of the commercial piezoelectric device PZT-5A were measured. With a high resolution laser interferometer, the amplitude of the vibrations at the surface were determined and related to the electric load characteristics. The experimental results were compared with estimations from a one dimensional theoretical model. The measurements are part of a program for defining vibration control techniques for ultrasound transducers and for absolute calibration of sensors. The characteristics and

sensibility of an experimental piezoelectronic acoustical transducer are also presented. Author (ESA)

N82-22487# Institut de Mecanique des Fluides de Lille (France).
AUTOMATION OF THE EXAMINATION OF HOLOGRAMS [AUTOMATISATION DU DEPOUILLEMENT DES HOLOGRAMMES]
A. Mayeur 20 Nov. 1980 62 p refs In FRENCH Sponsored by Direction des Recherches Etudes et Techniques
(IMFL-80-54; IMFL-8226) Avail: NTIS HC A04/MF A01

Total or partial automation of holographic image reconstruction, particularly for holograms generated by double exposure holography of three-dimensional aerodynamic fields, was sought. Tests were carried out with a specialized image processor and an optical image analyzer. An automatically controlled subassembly, consisting of scan device and hologram support, was also studied. Simulation and identification experiments were performed. Results show that this setup meets the requirements for automatic acquisition of basic data, i.e. position, diameter, and brightness associated with the image of a particle. Author (ESA)

N82-22488# Rolls-Royce Ltd., Derby (England).
USE OF HIGH-TEMPERATURE WIRE STRAIN GAUGES UP TO 320 C
J. Bartonicek and F. Chokle 1981 24 p Transl. into ENGLISH from VDI Rept. (West Germany), no. 313, 1978 p 303-309 Partly in ENGLISH and GERMAN
(PNR-90099; Trans-15782/TLT-00833) Avail: NTIS HC A02/MF A01

Quarter and half bridge strain gages were tested, then used to measure strain in a pressure vessel connected to its pipes and fittings. The pressure vessel was assessed and temperature effect on the gages was examined in a tube furnace. Gage adjustment and k-factor were checked in tensile tests. In temperature response time tests, high values are recorded compared to thermocouples. Response time in impact tensile tests is good. The vessel was fitted with half bridge gages on the inside and quarter bridges on the outside. The flange, with significant wall thickness, is a point of high thermal stress. In the blowdown test, the temperature remains constant, dynamic stress increases initially then lessens, producing nonperiodic rolling movements in the test pipeline. Author (ESA)

N82-22489# Rolls-Royce Ltd., Derby (England).
USE OF CAPACITANCE STRAIN GAUGES FOR STATIC MEASUREMENTS AT HIGH TEMPERATURES
M. Schulz 1981 21 p Transl. into ENGLISH from VDI Rept. (West Germany), no. 313, 1978 p 317-322 In ENGLISH and GERMAN Presented at 6th Intern. Conf. on Exptl. Stress Anal., 1978
(PNR-90100; Trans-15783/TLT-00834) Avail: NTIS HC A02/MF A01

Two commercially available capacitance strain gages were tested. Calibration, apparent strain, thermal hysteresis, drift, and maximum temperature were considered. The gages were calibrated on a four point bending beam with direct current heating subjected to pure bending strain. Apparent strain was recorded on a constant strain cantilever, fixed at one end, which could be heated to 1100 C in a furnace. Zero setting drift was determined on the constant strain cantilever. Creep behavior was investigated by applying a CERL gage to an unloaded triangular bending rod with strain of + 3700 micron/m. It is shown that the CERL gage is reliable up to 650 C. Author (ESA)

N82-22490# Brown Univ., Providence, R. I. Dept. of Physics.
DEVELOPMENT OF SOLID STATE INFRARED EMITTERS FOR GAS DETECTION APPLICATIONS Annual Report, Jun. 1980 - May 1981
Hendrik J. Gerritsen, Everett E. Crisman, and James T. Daly Jun. 1981 77 p refs
(GRI Proj. 5080-363-0310)
(PB82-133331; GRI-81/0001) Avail: NTIS HC A05/MF A01 CSCL 14B

The detection of carbon dioxide by optical absorption using an infrared Emitting Diode (IRED) has been demonstrated. Since IRED's required for this task are not commercially available they must be fabricated in the course of this research. To aid in the growth of the semiconductor, a computer program to calculate the III-V ternary phase diagram has been developed. The possibilities of developing solid state lasers or using nonlinear optical techniques to obtain a monochromatic light source are also discussed. GRA

N82-22491# National Inst. for Metallurgy, Randburg (South Africa). Analytical Chemistry Div.
OPTIMUM OPERATION OF A DIRECT-READING SPECTROMETER WITH EXCITATION BY A 5kW INDUCTIVELY COUPLED PLASMA TORCH
G. L. Moore, A. E. Watson, and G. M. Russell 14 Aug. 1981 40 p refs
(PB82-128737; NIM-2116; ISBN-0-86999-547-2) Avail: NTIS HC A03/MF A01 CSCL 14B

The optimum operating conditions, degree of interference from sodium ionization, and spectral interferences in a simultaneous 40 channel spectrometer having a data reduction system controlled by a microprocesser were examined. Excitation is provided by an inductively coupled plasma source of medium power, with a nominal maximum of 5 kW. The optimum conditions were ascertained for atomic lines, for ionic lines, and for compromise multielement analysis in aqueous solutions and in sodium solutions at concentrations up to 30g/l; the detection limits for 37 elements were determined. An increase of approximately 30 percent in the power input under the optimum conditions for multielement operation reduced the interference from ionization caused by up 30g of sodium per liter to less than 5 per cent relative. GRA

N82-23139# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Corporate Central Development.
SENSITIVITY AND RESOLUTION CRITERIA FOR INFRARED CAMERAS WITH ARRAY DETECTORS AND ANALYSIS FOR HIGH SPEED COMPUTATION REQUIREMENTS
Horst Prem, George W. Stroke, and Jean-Pierre Fouilloy (Telecommunications, Radioelectriques et Telephoniques Corp.) *In its* Res. and Develop. at MMB. Tech. and Sci. Publ. 1981 1981 5 p refs Presented at SPIE's Adv. Program LA 82 Los Angeles Tech. Symp. and Exhibition, Los Angeles, 29 Jan. 1982
(For primary document see N82-23137 13-99)
(MBB-Z-3-81-OE) Avail: NTIS HC A09/MF A01

36 LASERS AND MASERS

Includes parametric amplifiers.

N82-22492*# North Carolina Central Univ., Durham. Dept. of Physics.
OPTICALLY PUMPED SUBMILLIMETER-WAVES AND APPLICATIONS Final Report
Jyotsna M. Dutta and Charles R. Jones [1982] 14 p refs
(Grant NsG-5120)
(NASA-CR-168769; NAS 1.26:168769) Avail: NTIS HC A02/MF A01 CSCL 20E

Rapid development of optically pumped lasers has shown the potential to be used as a source for a high resolution spectrometer. In this connection, a compact, stable FIR laser was designed, fabricated, and assembled, integrating both the pump laser and the FIR cavity in the same mechanical structure for its improved (both thermal and mechanical) stability and mobility. Performance of the mixer structure which was designed and constructed for the evaluation of the Schottky diodes was found to be satisfactory. The feasibility of generating tunable sideband for molecular spectroscopy studies was demonstrated. Author

N82-22493# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
PRACTICAL PROBLEMS WITH CO2 LASER RADAR TESTS [ERFARENHETER FRAAN FOERSOEK MED CO2-LASERRADAR]
Kai Gullberg and Anders Widen Sep. 1981 25 p refs In SWEDISH
(FOA-C-30221-E1) Avail: NTIS HC A02/MF A01

A description of laser radar systems being tested is given.

The reason the systems were abandoned is discussed. Some recurrent problems, often trivial, are dealt with as well as some common components. Practical, optical problems are emphasized. J.M.S.

N82-22494# National Physical Lab., Teddington (England). Div. of Mechanical and Optical Metrology.
FREQUENCY DEPENDENCE OF A 633-nm He-Ne LASER STABILIZED BY 127I2, UPON IODINE PRESSURE, MODULATION AMPLITUDE, AND WALL TEMPERATURE
W. R. C. Rowley Sep. 1981 17 p refs
(NPL-MOM-54; ISSN-0309-3069) Avail: NTIS HC A02/MF A01

The beat frequency of the frequency shifts of a 633 nm He-Ne laser (S) stabilized by intracavity saturated absorption to hyperfine components e and f of Iodine was measured. The reference laser (M) had an unheated iodine cell and an 18 C cold finger temperature. Half the observations were of S locked to iodine peak 2, M locked to f, and the rest with components interchanged. Linear frequency to pressure and frequency to modulation relations result, with the coefficients and extrapolated intercepts at zero pressure being dependent on the wall temperature. These relations are expressed in an empirical formula that enables the frequency correction to be calculated within + or - 5% for any deviation from standard operating parameters. Author (ESA)

N82-22495# National Physical Lab., Teddington (England). Div. of Mechanical and Optical Metrology.
DEVELOPMENT OF OPTICALLY PUMPED MOLECULAR DIMER LASERS AT NPL
G. P. Barwood Jan. 1982 20 p refs
(NPL-MOM-58; ISSN-0309-3069) Avail: NTIS HC A02/MF A01

Continuous wave laser oscillation was demonstrated in iodine by pumping with a krypton ion laser at 521 nm and 531 nm. Simultaneous oscillation on up to 16 lines in the range 540 nm to 650 nm was observed and over 50 lines were measured and identified. The threshold pump power is 80 mW at 531 nm. A sodium dimer laser was investigated and 27 laser lines were obtained in the range 520 nm to 560 nm by pumping with the blue lines of an argon ion laser. Up to 5 mW output power can be obtained with only 80 mW of single frequency pump power at 472.7 nm. Author (ESA)

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N82-22496*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CLUTCHLESS MULTIPLE DRIVE SOURCE FOR OUTPUT SHAFT Patent Application
Larry D. Webster, inventor (to NASA) (Army Aviation Research and Development Command, Moffett Field, Calif.) Filed 2 Mar. 1982 11 p Sponsored by NASA
(NASA-Case-ARC-11325-1; US-Patent-Appl-SN-354126) Avail: NTIS HC A02/MF A01 CSCL 13I

A first shaft is connected to a source of rotational power and has a gear fixedly mounted on the shaft. A second gear is fixedly mounted on a gear shaft that is parallel to the first shaft. A third gear, also fixedly mounted on gear shaft, meshes with a fourth gear fixedly mounted on the output shaft. The first input shaft and output shaft are rotatably mounted through a housing that is itself rotatable with respect to a support. Both shafts are coaxial and in end-to-end relationship. A second input shaft is connected to a second source of rotational power. A fifth gear, fixedly mounted on second input shaft, meshes with a sixth gear, which is fixedly mounted on rotatable housing and in coaxial relationship with first input shaft. In operation, the first drive source and gear train provide rotational power in a first direction to drive the output shaft in a given direction of rotation. The second source of rotational power may be operated either to decrease the rate of rotation imparted to the output shaft by the first source of rotational power, or to increase that rate of rotation, depending on which direction the housing is rotated by the second source of rotational power. NASA

N82-22497*# National Aeronautics and Space Administration. Pasadena Office, Calif.
ACOUSTIC BUBBLE REMOVAL Patent Application
Eugene H. Trinh (JPL, California Inst. of Tech., Pasadena), Daniel D. Elleman (JPL, California Inst. of Tech., Pasadena), and Taylor G. Wang, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 21 Jan. 1982 12 p
(Contract NAS7-100)
(NASA-Case-NPO-15334-1; US-Patent-Appl-SN-341406) Avail: NTIS HC A02/MF A01 CSCL 13H

A method is described for removing bubbles from a liquid bath, such as a bath of molten glass to be used for optical elements. Larger bubbles are first removed by applying acoustic energy resonant to a bath dimension to drive the larger bubbles toward a pressure well where the bubbles can coalesce and then be more easily removed. Next, submillimeter bubbles are removed by applying acoustic energy of frequencies resonant to the small bubbles to oscillate them and thereby stir liquid immediately about the bubbles to facilitate their backup and absorption into the liquid. NASA

N82-22498# Rocketdyne, Canoga Park, Calif.
RPE-10 COMPOSITE FLYWHEEL TESTING Final Report
B. R. Ginsburg 15 Jun. 1981 47 p ref Prepared for California Univ., Livermore. Lawrence Livermore Lab.
(Contract W-7405-eng-48)
(UCRL-15379; RI-RD81-166) Avail: NTIS HC A03/MF A01

A final report on the technical efforts in testing an RPE-10 composite flywheel is presented. The RPE-10 composite flywheel (unit no. 2) designed and fabricated for vehicle use, was tested to a speed of 21,600 rpm, at which time the overwrap separated from the flywheel, terminating the test. The primary cause of failure was attributed to overheating in the test cell, causing a deteriorization in material properties of the epoxy bond. The RPE-10 composite flywheel unit no. 1 was successfully tested without failure to 24,120 rpm. At this speed, the rotor stored over 2.0 kilowatt hours of kinetic energy. M.D.K.

N82-22499# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
PROTOTYPE FLYWHEEL SPIN TESTING PROGRAM Final Report, 21 Mar. 1980 - 15 Apr. 1981
D. W. Rabenhorst and W. O. Wilkinson Apr. 1981 59 p refs Prepared for California Univ., Livermore. Lawrence Livermore Lab.
(Contract W-7405-eng-48)
(UCRL-15381; SDO-5988) Avail: NTIS HC A04/MF A01

Flywheels were spin tested to determine for each flywheel (1) the rotational speed at flywheel failure and (2) within the capability of the facility, the initiation and mode of failure of the flywheel. The flywheel tested ranged in size from 12.0 to 24.0 inches diameter; in weight from 5.0 to 28.5 pounds, and in energy at failure up to 711 watt hours. M.D.K.

N82-22500# Federal Aircraft Establishment, Emmen (Switzerland). Research and Testing Dept.
TESTING OF METAL BELLOWS AND SPRINGS IN SUPPORT OF THE DEVELOPMENT OF A VAPOR COMPRESSOR FOR SPACE FLIGHT APPLICATION Final Report
F. Berner, H. Oesch, H. Steinhauser, and O. Joeri Apr. 1979 19 p refs
(Contract ESTEC-3446/77-NL-PP(SC)-R-1)
(FO-1466; ESA-CR(P)-1230) Avail: NTIS HC A02/MF A01

The bellows are subject to oscillatory axial movements at frequencies well above those for which there is industrial experience. The background of these tests, the test installation, the tested elements, and the test conditions and results are described. Since none of the test specimens failed during the tests, it is concluded that the likelihood of a failure of either one of the bellows during a mission is quite small, particularly so if they are replaced by new ones after about 500 hours of operating time. Author (ESA)

N82-22501# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.

AIR TARGET EFFICIENCY. BASIS FOR CALCULATING FRAGMENT PENETRATION POWER [VERKAN I LUFTMAAL. UNDERLAG FOER BERAAKNING AV SPLITTERS PENETRATIONSFOERMAAGA]

Ingrid Gyllenspetz May 1981 54 p refs In SWEDISH
(FOA-C-20410-D4) Avail: NTIS HC A04/MF A01

Equations for fragment penetration depths and perforation limits are presented. The latter supports previous equations used for aluminum, steel, and heavy metals and should be valid for higher speeds of impact and to extrapolate to unknown materials. Fragment penetration in layered plates at high speeds and the influence of the impact angle on penetration are discussed. J.D.

N82-22502# Curtiss-Wright Corp., Wood-Ridge, N.J.

HIGH-TEMPERATURE-TURBINE TECHNOLOGY PROGRAM. PHASE 2: TECHNOLOGY TEST AND SUPPORT STUDIES. TURBINE SPOOL TECHNOLOGY RIG CASCADE TESTS

Jun. 1981 95 p
(Contract DE-AC01-76ET-10348)
(DE81-030352; DOE/ET-10348/T3; FE-2291-76; CW-WR-76-020.76A) Avail: NTIS HC A05/MF A01

Integrated gas turbine combined cycle electric power generating systems offer the promise for using coal in an economic and environmentally acceptable manner. Powerplant efficiencies well above 40% may be achieved with gas turbine firing temperatures of 26000 F and higher, if the turbine cooling requirements are not excessive. Transpiration air cooling protects turbine components from the aggressive environment produced by the combustion of coal derived fuels. A new single stage, high work transpiration air cooled turbine was designed and fabricated for evaluation in a rotating test vehicle designated the turbine spool technology rig (TSTR). Prior to operating the TSTR, a cascade test program was conducted on a 10 vane sector to determine the cooling characteristics of these parts and to develop changes as required to assure satisfactory operation of the TSTR. The cascade program is described including several changes incorporated into the vanes. DOE

N82-22503# Messerschmitt-Boelkow-Blohm G.m.b.H., Hamburg (West Germany). Unternehmensbereich Hamburger Flugzeugbau.

DEVELOPMENT OF VIBRATION DAMPERS THAT REDUCE RIVETING NOISE IN AIRCRAFT CONSTRUCTION Final Report

Norbert Kosuch Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 63 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-81-017; ISSN-0171-7618) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13,45

The origin and properties of riveting noise were examined. Vibration absorbers for the reduction of noise levels during riveting on thin metal sheets were developed. Commercial damping materials were used in conjunction fastening by negative pressure. Suction dampers developed from commercial siphons produced a reduction in riveting noise of zero to 4 dB (A). Dampening rails which press 0.08 sqm damping materials onto the sheets produced 5 to 6 dB (A). It is found that vacuum mats are better than the other dampers because of powerful direct fastening of large damping materials usual in trade by negative pressure; it is possible to reduce riveting noise from the components by up to 9 dB (A) with a vacuum mat surface area of only 0.3 m2. Author (ESA)

N82-22504# National Engineering Lab., East Kilbride (Scotland). Fluid Mechanics Div.

MEASUREMENT TECHNIQUES AND ANALYSIS OF FLUID-BORNE NOISE IN PUMPS

P. J. McNulty May 1981 23 p refs
(NEL-674; ISSN-0305-1439) Avail: NTIS HC A02/MF A01

The application of noise measuring instrumentation and techniques to the detection of fluid-borne noise, particularly cavitation noise, in pumps is reviewed and noise variation with pump speed and flow rate is considered. Pump noise can be reliably measured by high frequency piezoelectric response transducers in contact with the fluid. Cavitation noise suppresion requires suction energy values substantially above the point where efficiency is affected. By using a sound power ratio analysis technique, a speed index of 5 for sound power was determined for several pumps. The average pump spectrum peaks at a nondimensional frequency of 2 and then falls at 4 db/octave. The state of the art of the electronic links in the chain from noise phenomena through the instrumentation to the observer has progressed to a point where the weakest link is the observer. Pump tip speed should be kept as low as possible since noise increases with speed. Author (ESA)

N82-22505# Rolls-Royce Ltd., Derby (England).

THE INFLUENCE OF HARD SURFACE COATINGS ON THE PERFORMANCE OF DOUBLE RAKE CUTTING TOOLS

J. O. Fowler, W. A. Draper, and R. T. Derricott 1981 28 p refs
(PNR-90080) Avail: NTIS HC A03/MF A01

The influence of geometry modifications on the cutting force, cutting temperature, surface finish, tool life, and geometry of chip formation of uncoated and titanium nitride coated tools is investigated. Primary rake angles of between -10 and -40 deg, together with a range of land widths, were generated on ISO P20 grade tool tips by a grinding jig. One batch was uncoated, while a second was coated under commercial conditions with between 8 to 12 microns of TiN. Both batches were used to cut, orthogonally, normalized 50 mm steel tube with 3.125 mm wall thickness, at a speed and feed rate of 76 m/min and 0.21 mm/rev. Significant improvements in cutting performance, particularly with regard to catastrophic failure when cutting steels, are achieved by the generation of a narrow primary rake land, the width and angle of which depends on the cutting conditions. Author (ESA)

N82-22506# Rolls-Royce Ltd., Derby (England).

BALL BEARING MACHINERY DIAGNOSTICS

R. Ullmann and H. Wohllebe Oct. 1981 21 p refs Transl. into ENGLISH from Maschinebautech. (West Germany), v. 26, no. 3, 1977 p 116-120 Partly in ENGLISH and GERMAN
(PNR-90087; Trans-15660/TLT-00824) Copyright. Avail: NTIS HC A02/MF A01

Diagnostic methods of detecting defects in the rolling faces of ball bearings, based on an assessment of the running characteristics of the bearing, are reviewed. Methods with the bearing removed from the machinery include measurement of outer race displacement, relative to the fixed inner race in an axial or radial direction with a defined load, and elastic deformation of the outer race followed by measurement of spring back travel with the inner race rotating. With the bearing installed, subjective methods such as checking lubricant noise, or assessing running noise with a stethoscope are used. Vibration measurement is the standard objective test. Shaft deflection is measured by noncontact inductive pickups. Solid-borne sound can be assessed by frequency analysis. Author (ESA)

N82-22507# National Centre of Tribology, Risley (England). European Space Tribology Lab.

THE BEHAVIOUR OF OIL LUBRICATED ANGULAR CONTACT BEARINGS OPERATING AT SLOW SPEED

K. T. Stevens May 1981 38 p refs
(Contract ESA-2584/75/MD)
(ESA-ESTL-051; ESA-CR(P)-1517) Avail: NTIS HC A03/MF A01

Vacuum tests were performed in order to determine the wear and torque of oil lubricated bearings operating at a speed corresponding to the boundary lubrication regime. The predominant form of damage on the races and balls is micropitting, partly caused by repeated identation of the steel surface by small, hard features. The scale of damage is small and has no significant effect on the torque characteristics. There should be no deterioration of the bearings in reaction wheels operating down to zero speed. The amount and type of damage changes very little with the type of oil used so that the choice of lubricant for variable speed bearings in spacecraft applications can be made on the basis of vapor pressure and viscosity, without regard to boundary lubricating properties. Author (ESA)

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N82-22508# Institut Foerster G.m.b.H. und Co. K.G., Reutlingen (West Germany). Hauptbereich Forschung und Entwicklung.
BASIC INVESTIGATION INTO THE DEVELOPMENT OF AN EDDY CURRENT TEST METHOD FOR QUALITY CONTROL OF WELDED NONFERROMAGNETIC TUBES Final Report, Dec. 1979
Gerhard Woerner Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 82 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-210; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17,20

Standard eddy current test methods for characterizing the quality of welded tubes are discussed and found to be lacking in sensitivity. These methods do not reliably detect outer or inner tube surface defects with a depth on the order of 10% of the wall thickness. The eddy current distribution around artificial defects and weld inhomogenities was checked, distinguishing criteria between the different defect types. Various probe arrangements as well as different methods of signal generation and acquisition were used. Results led to the assembly of a rotating test head with optimized probe arrangement which yields, by a factor of 2 to 3, higher defect sensitivity compared with standard methods. Application of the test head for in-service inspection, however, shows that 10% deep surface defect detection is still not achieved. Use of this inspection method with improved welding techniques is suggested in order to obtain desired quality. Author (ESA)

N82-22509# National Aerospace Lab., Amsterdam (Netherlands). Div. of Structures and Materials.
CONVENTIONAL AND INNOVATIVE APPLICATIONS OF MAGNETIC RUBBER
E. A. B. deGraaf 6 Nov. 1980 21 p refs Presented at New Ideas in NDT Symp., Northhampton, England, 9 Dec. 1980 Sponsored by Royal Netherlands Air Force
(NLR-MP-80043-U) Avail: NTIS HC A02/MF A01

A technique which uses magnetic rubber in order to obtain replicas of failed components for nondestructive tests (NDT) is compared with conventional techniques. Magnetic rubber inspection techniques, along with fluorescent ink, fluorescent penetrant, ultrasonics and eddy currents, were applied to aircraft landing gear components rejected because of either crack indications or exceedance of the safe service life. The magnetic rubber technique shows promise. Applications of magnetic rubber include the replication for measurement of electric discharge machined artificial cracks in NDT calibration standards, and high sensitivity NDT, using the scanning electron microscope.
Author (ESA)

N82-22510# Engins Matra, Velizy (France). Div. Assurance Produit.
QUALITY CONTROL OF LSI AND VLSI INTEGRATED CIRCUITS: VLSI ASSEMBLY AND NEW TRENDS [L'ASSURANCE QUALITE DANS LES CIRCUITS INTEGRE LSI ET VLSI: ASSEMBLAGE DES VLSI ET NOUVELLES TENDANCES]
Bernard G. Brisabois and Jacques Robineau May 1981 39 p In FRENCH Presented at ADERA Sem. Assurance Qualite
(BB-81) Avail: NTIS HC A03/MF A01

A management program that assures quality/total reliability of VLSI circuits is described. The program has a bearing on every aspect of product development and evolution. Interaction between the different stages is emphasized. The establishment of strict quality standards in the execution of the various procedures, leading up to delivery of a product are emphasized. The management program assures that these standards are met, that they are only changed to improve the product, and that effective coordination exists. Author (ESA)

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N82-22511 Pennsylvania Univ., Philadelphia.
SURFACE ROUGHNESS EFFECTS ON THE STRENGTH OF ADHESIVE JOINTS: APPLICATIONS TO ORTHODONTIC DIRECT BONDING Ph.D. Thesis
Thomas Robert Katona 1981 307 p
Avail: Univ. Microfilms Order No. 8127040

The relation between the clinical retention of adhesively bonded dental brackets and the acid etching technique used to precondition the dental enamel is addressed. Scanning electron microscopy and surface tracing studies indicate dramatic changes in the enamel surface roughness due to etching. A finite element program was used to examine the stress distributions in the vicinity of idealized surface roughness asperities. Through a parametric study, equations were found to express the relationships between asperity geometry (slopes, height, and tip curvature) and various failure criteria (maximum stress, Coulomb-Mohr, Mises, and mode I and II fracture). Results can be generalized to all structural adhesive joints. The changes in the acid etched surface are related to the resulting stresses in the adhesive joint, and hence, its likelihood of failing in service is discussed. Dissert. Abstr.

N82-22512 Illinois Univ. at Urbana-Champaign.
FRACTURE KINETICS OF HYDROGEN EMBRITTLED NIOBIUM Ph.D. Thesis
Barry Scott Hindin 1981 175 p
Avail: Univ. Microfilms Order No. 8127607

Kinetics of crack propagation in hydrogen charged niobium were studied in the temperature range 77 to 303 K and for hydrogen concentrations between 0.068 and 3.2 at.%. Crack velocities between 10(-8) and 10(-2) m/s were determined as a function of the Mode I stress intensity factors using single edge notch and double torsion specimens. Validity of the double torsion technique was established using a variety of methods including photoelastic analysis of the stresses in the plane normal to the specimen's crack surface. Increasing, decreasing and constant k sub 1 tests were carried out and the 1nV versus k sub 1 data exhibited various behavior depending upon the type of loading. Linking up of fracturing hydrides were shown to be responsible for a unique three region (V-K) behavior which occurred only at intermediate temperatures for decreasing k sub 1 tests. Dissert. Abstr.

N82-22513 Illinois Univ. at Urbana-Champaign.
AN ANALYTICAL STUDY OF THE FATIGUE NOTCH SIZE EFFECT Ph.D. Thesis
Pranab Kanti Mazumdar 1981 86 p
Avail: Univ. Microfilms Order No. 8127638

An analytical expression for K sub f in terms of notch depth (A), elastic stress concentration factor (K sub t) and initiated crack length (a sub I) was developed. Together with the strain controlled fatigue concepts and the Newman's stress intensity correction factor solution, the expression for K sub f was used to study the notch size effect and other phenomena related to the notch size effect. Results indicate that the notched specimen behavior was best represented by Peterson's equation rather than Neuber's equation. The material constant (a) based on Peterson's equation, for steels and aluminum alloys, was related to the strain controlled fatigue properties and the fatigue crack propagation parameters. Conditions for which nonpropagating fatigue cracks will form were also studied. The analytical expression for K sub f was used to evaluate the length of the nonpropagating cracks as a function of the stress level. A universal plot based on the theories developed for notched specimens is proposed that well describes the behavior of cracked specimens. Dissert. Abstr.

N82-22514 California Univ., Berkeley.
ADAPTIVE FINITE ELEMENT METHOD IN TWO-

DIMENSIONAL STRUCTURAL PROBLEMS **Ph.D. Thesis**
Tetsuji Itoh 1981 179 p
Avail: Univ. Microfilms Order No. 8200146

An adaptive finite element method which searches for a satisfactory solution by refining selective elements and representing an adequate mesh pattern for a two dimensional structural problem is presented. The adaptive finite element method evaluates local a-posteriori residual errors for each element, residuals caused by both the equilibrium equation within an element and the discontinuity of tractions along the edge. When the residual error of the element exceeds the specified accuracy, the element should be refined. The refinement process is repeated until the final refined mesh pattern produces the satisfactory solution. An absolute-relative finite element formulation is introduced to construct a global stiffness matrix and a load vector at the refinement level. A modified conjugate gradient method which uses the stiffness matrix transformed by the lower triangular matrix calculated by the incomplete Cholesky factorization proves to be the most effective solution technique.

Dissert. Abstr.

N82-22515# British Aerospace Aircraft Group, Preston (England). Structures Group.
THE TORSION TESTING OF TWO NOTCHED 0 DEG, + OR - 45 DEG CFC TUBES (RFT 852/BT 4)
R. P. Worthington Nov. 1981 14 p
(BAe-TN-5224; CFR/TR/05) Copyright. Avail: Issuing Activity

Two 0 deg + or - 45 deg carbon fiber composite notched tubes (T40, T41) were tested in pure torsion. The tubes were constructed from twelve layers of laminate, using fiber type HJS 132 SC and resin system BSI 914. The notches consisted of two 6.35 holes half way along the tube, diametrically opposite each other. The tubes were strain gaged. The main failure mode is a crack through one hole at + 45 deg to the tube axis. In the case of T40 this crack consists of the fracture of - 45 deg fibers, debonding between fibers and matrix in the + 45 deg direction. Buckling of outer layer fibers causes debonding between + 45 deg and the matrix and delamination between + 45 and - 45 deg fibers. The main failure for T41 is in the - 45 deg direction, i.e., a buckling of the outer layer fibers with all other features as described for the - 45 deg failure for T40. For T41 however, there is no crack in the + 45 deg direction.

Author (ESA)

N82-22516*# Lehigh Univ., Bethlehem, Pa.
THE AXISYMMETRIC ELASTICITY PROBLEM FOR A LAMINATED PLATE CONTAINING A CIRCULAR HOLE
F. Delale (Drexel Univ.) and F. Erdogan Jul. 1981 34 p refs
(Contract NGR-39-007-011; NSF CME-78-09737)
(NASA-CR-168759; NAS 1.26:168759) Avail: NTIS HC A03/MF A01 CSCL 20K

The elasticity problem for a laminated thick plate which consists of two bonded dissimilar layers and which contains a circular hole is considered. The problem is formulated for arbitrary axisymmetric tractions on the hole surface by using the Love strain function. Through the expansion of the boundary conditions into Fourier series the problem is reduced to an infinite system of algebraic equations which is solved by the method of reduction. Of particular interest in the problem are the stresses along the interface as they relate to the question of delamination failure of the composite plate. These stresses are calculated and are observed to become unbounded at the hole boundary. An approximate treatment of the singular behavior of the stress state is presented and the stress intensity factors are calculated.

S.L.

N82-22517*# Texas Univ. at Arlington. Center for Aeronautical Research.
MODAL VECTOR ESTIMATION FOR CLOSELY SPACED FREQUENCY MODES
Roy R. Craig, Jr., Yung-Tseng Chung, and Mark Blair 1 Feb. 1982 41 p refs
(Contract NAS8-33980)
(NASA-CR-162001; NAS 1.26:162001; CAR-82-1) Avail: NTIS HC A03/MF A01 CSCL 20K

Techniques for obtaining improved modal vector estimates for systems with closely spaced frequency modes are discussed. In describing the dynamical behavior of a complex structure modal parameters are often analyzed: undamped natural frequency, mode shape, modal mass, modal stiffness and modal damping. From both an analytical standpoint and an experimental standpoint, identification of modal parameters is more difficult if the system has repeated frequencies or even closely spaced frequencies. The more complex the structure, the more likely it is to have closely spaced frequencies. This makes it difficult to determine valid mode shapes using single shaker test methods. By employing band selectable analysis (zoom) techniques and by employing Kennedy-Pancu circle fitting or some multiple degree of freedom (MDOF) curve fit procedure, the usefulness of the single shaker approach can be extended.

E.A.K.

N82-22518# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
MINIMUM MAXIMUM DEFLECTION AND STRESS DESIGN OF BEAMS UNDER HARMONIC EXCITATION BY MATHEMATICAL PROGRAMMING
S. Adali Jul. 1981 31 p refs
(CSIR-TWISK-214) Avail: NTIS HC A03/MF A01

The optimal distribution of the cross sectional area of a beam subject to harmonically oscillating loads of the same forcing frequency is computed. The objective function minimized is the maximum dynamic deflection or stress of the beam. The cross sectional area is approximated by splines of order zero or one, and the values of the splines at the knots serve as design variables. The design algorithm consists of successive stages of analysis and optimization. The analysis for a given cross sectional shape is carried out by iteratively solving an equivalent integral equation formulation of the problem. The optimization stage is carried out by using a quasi-Newton minimization routine. The numerical results for statically determinate and statically indeterminate beams indicate that the maximum deflection and normal stress of optimally designed beams are considerably smaller than those of uniform beams.

S.L.

N82-22519# Royal Aircraft Establishment, Farnborough (England).
THE QUANTITATIVE ANALYSIS OF FATIGUE CRACKING UNDER PROGRAMMED LOADING
C. J. Peel and P. J. E. Forsyth 28 May 1980 24 p refs
(RAE-TR-80073; RAE-MAT-400; BR81552) Avail: NTIS HC A02/MF A01

The premature failure of an undercarriage cylinder during a test in which severe and standard ground handling were represented by servohydraulic simulations of vertical, drag, and side loads is discussed. Fatigue crack growth rates were predicted using a modified version of the Forman law. The predicted growth rates are within + or - 30% of those determined from measurements of striation spacings. The predicted total life is within 10% of that obtained. A significant error in the prediction of growth rates results from a beneficial load interaction effect caused by a change in the severity of the landing duty cycle from that representing severe ground handling conditions to that for normal ground handling conditions. Premature initiation of the fatigue crack is attributed to poor surface finish of the cylinder in the region of a change in section. The poor finish raises the stress concentration of the change in section from 1.7 to 5.

Author (ESA)

N82-22520# Royal Aircraft Establishment, Farnborough (England).
STRESS INTENSITY FACTORS FOR CRACKS AT LOADED HOLES
D. P. Rooke and J. Tweed (Old Dominion Univ.) 10 Jul. 1981 41 p refs
(RAE-TR-81086; RAE-MAT-435; BR81117) Avail: NTIS HC A03/MF A01

A method for obtaining the opening mode and sliding mode stress intensity factors for the tip of a crack at the edge of a circular hole with arbitrary loads on its perimeter is presented. The method uses the solutions of a singular integral equation which arises from expressing the equations of elasticity in terms of Mellin transforms. Four load distributions are considered: a uniform tensile stress remote from the hole; a point load on the perimeter of the hole; uniform pressure on an arc of the perimeter; and a cosine distribution of pressure on the perimeter.

Results show that the stress intensity factor for a short crack is strongly dependent on the distribution of load around the hole. This implies that fatigue lifetime estimates can be seriously wrong unless the structural load distribution component is known accurately. A procedure for studying arbitrary loads on the hole perimeter is indicated. Author (ESA)

N82-22521# Rolls-Royce Ltd., Derby (England).
HIGH-TEMPERATURE STRAIN MEASUREMENTS ON NUCLEAR REACTOR PRESSURE VESSEL STUD BOLTS
H. Joas Oct. 1981 24 p refs Transl. into ENGLISH from VDI Rept. (West Germany) no. 313, 1978 p 879-885 In ENGLISH and GERMAN Presented at 6th Intern. Conf. On Exptl. Stress Anal., 1978
(PNR-90093; Trans-15785/TLT-00836) Avail: NTIS HC A02/MF A01

The calculation method used in safety analyses of pressure vessel bolts was investigated. Free grid high temperature strain gages, fitted with chromel-ålumel thermocouples were attached by flame spraying to the bolts. The bolts were placed in a furnace in order to stabilize gage temperatures. Stabilization occurs after 320C. Gage performance was established in temperature and tensile pretests. Test measurements were made during hot trial operation of two reactors under nonnuclear conditions with the reactor core activated. Total bolt stresses due to initial stress on the bolt joint, pressure vessel internal pressure, and additional stresses during startup and shutdown were examined. Surface stress across the bolt cross section was measured. Bending effects on bolts were determined. The uniform supporting behavior of individual bolts was checked. Measured and predicted stresses agree satisfactorily. Author (ESA)

N82-22522# National Physical Lab., Teddington (England). Div. of Materials Applications.
THE STRENGTH OF SINGLE E-GLASS FIBRES IN WATER
J. M. Sillwood Jan. 1982 28 p refs
(NPL-DMA(B)19; ISSN-0143-7313) Avail: NTIS HC A03/MF A01

Strength measurements on single glass fibers in water for a range of strain rates and fiber lengths are described. A Weibull cumulative distribution function is used to account for the scatter in experimental results and a value is given for the Weibull modulus. The variation between strength measurements is used to obtain values for the crack growth parameters, n and alpha, but these are not consistent with previously reported values. The extremely high value of n (54) could result from flaws introduced during mounting and testing of the fibers or from velocities attained during constant strain rate tests which were unaccounted for. Author (ESA)

N82-22523# Rolls-Royce Ltd., Derby (England).
MATERIAL STRESSING IN A HERTZIAN CONTACT: INFLUENCE OF LOAD AND INTERNAL STRESSES
E. Broszeit, F. Schmidt, and H. J. Schroeder Mar. 1981 10 p refs Transl. into ENGLISH from Z. Werkstofftech. (West Germany), v. 9, 1978 p 210-214 Partly in ENGLISH and GERMAN
(PNR-00103; Trans-15603/TLT-00820) Avail: NTIS HC A02/MF A01

The influence of a two dimensional field of internal stress on material stressing, resulting from Hertzian pressure, e.g. on gear wheels, is discussed. When calculating material stressing due to an elliptically distributed normal force (Hertzian pressure distribution), only the conditions at the point Z, $> X = Y = 0$, need be considered. At this point the maximum stresses occur in the surface and in the volume of the material, respectively. The stresses decrease towards the rim. When internal stresses are present in the material, material stressing in the entire region of contact and beyond must be considered. The superposition of load stresses and internal stresses can lead to stressings of the material with a maximum in the region of the rim of the contact area. Consideration of the conditions in the center of the contact area alone can lead to misinterpretations. Author (ESA)

N82-22524# Ruhr Univ., Bochum (West Germany). Inst. fuer Mechanik.
APPROXIMATIONS AND ERROR ESTIMATES IN EIGENVALUE PROBLEMS OF ELASTIC SYSTEMS WITH APPLICATION TO EIGENVIBRATIONS OF ORTHOTROPIC PLATES
H. Stumpf and F. J. Biehl Dec. 1979 34 p refs
(Mitt-17) Avail: NTIS HC A03/MF A01

The most efficient method for calculation eigenvalues is the classical Rayleigh-Ritz method, or equivalent geometrical-compatible finite procedures, which yields upper bounds for the exact eigenvalues. Lower eigenvalue bounds are obtained by calculating upper bounds for the invariants of Green's integral operator, leading to a satisfactory statement about the quality of the eigenvalue approximation. Together with the eigenvalues, geometrical-compatible procedures yield approximations to the eigenstates for which global error estimates are obtained by using upper and lower eigenvalue bounds. With appropriate Green's states, pointwise error bounds are also derived for arbitrary field quantities of the eigenstates. A numerical example of the method is presented for clamped rectangular orthotropic plates. Author (ESA)

N82-22525# Technical Research Centre of Finland, Espoo. Metals Lab.
CORRELATION BETWEEN IMPLANT AND RESTRAINT TEST
Risto Karppi (Acad. of Finland), Jouko Ruusila, Pekka Rajamaeki, and Karri Vartiainen Jun. 1981 26 p refs Sponsored by Hoogovens, Oxelosund, Ovako, Rautaruukki and Esab
(VTT-RR-8/81; ISBN-951-38-1267-7; ISSN-0358-5077) Avail: NTIS HC A03/MF A01

The accuracy of the implant test of cold cracking of steels was assessed. Hydrogen cracking results obtained with the implant test and restraint test, using the remaining diffusible hydrogen content and stress field parameters, are compared. Structural steels with 500 and 800 N/sqmm tensile strengths were arc welded. Weld heat input and weld deposit hydrogen content were varied. It is suggested that the scope of the implant test is widened, to include the determination of safe welding conditions. Author (ESA)

N82-22526# National Engineering Lab., East Kilbride (Scotland). Service Loading Div.
FINITE ELEMENT METHODS APPLIED TO TWO FRACTURE TEST SPECIMENS
J. K. Sharples Jun. 1981 39 p refs Sponsored by Engineering Materials Requirement Board
(NEL-675; ISSN-0305-1439) Avail: NTIS HC A03/MF A01

Finite element programs are used to analyze crack growth. A fretting fatigue specimen was idealized and mode 1 stress intensity factors were calculated using Rice's J-integral method. Mode 2 stress intensity factors were obtained by the compliance method for an edge sliding mode specimen. In both cases the effect of varying the mesh design was considered. The results, when compared with the literature are not satisfactory. Author (ESA)

N82-22527# Societe Nationale Industrielle Aerospatiale, Paris (France).
FRETTING CORROSION
M. Armbruster 1981 49 p refs In FRENCH Presented at ETCA Congr., Arcueil, France
(SNIAS-821-551-102; C-43-215) Avail: NTIS HC A03/MF A01

The mechanical aspects of corrosion brought about by contact between components subject to vibration are considered. Contact corrosion stops the component working, since the oxide produced occupies more space than the original piece. It is accompanied by microcracking which leads to large scale fatigue cracking. Oxidation becomes progressively worse as the first oxidized layer is rubbed off, exposing the next layers. Thermal effects are important causes of oxide formation and also involves microscopic surface roughness, shearing, and abrasion. Diagnosis is often difficult because of separating chemical and mechanical factors. Corrosion is reduced by designs which minimize movement, better surface finishing, and the use of resistant materials. Author (ESA)

N82-22528# Fraunhofer Inst. fuer Werkstoffmechanik, Freiburg (West Germany).
NUMERICAL DETERMINATION OF THE J INTEGRAL WITH REGARD TO STABLE CRACK GROWTH [NUMERISCHE

ERMITTLUNG DES J-INTEGRALS UNTER BERUECKSICHTIGUNG STABILEN RISSWACHSTUMS]

D. Siegele, W. Schmitt, and H. Stoeckl Sep. 1981 21 p refs In GERMAN

(W-3/81) Avail: NTIS HC A02/MF A01

The integral for stable crack growth in a side grooved structural member as specimen was calculated by ADINA with and without stable crack growth simulation. The J-integral was numerically determined with the Rice line integral as well as with the Parks method of virtual crack elongation. The numerical methods show a path independent J-integral. The J-values deduced from the change in potential energy degree with the line integral. For large crack elongations a decrease in the rise of the crack resistance curve is observed. Author (ESA)

N82-22529# Rolls-Royce Ltd., Derby (England).

IDENTIFYING FATIGUE CRACK GROWTH BY ACOUSTIC EMISSION (AE)

T. J. Holroyd 1981 6 p refs Sponsored in cooperation with UK Procurement Executive of the Ministry of Defence

(PNR-90075) Avail: NTIS HC A02/MF A01

The temporal distribution technique, which improves detectability of low crack growth rates in the presence of background noise, is introduced. The effects of correlated and uncorrelated noise are removed from analysis by setting a window which excludes correlated noise peaks from the AE peak studied. The uncorrelated noise is characterized in a region of the stress cycle with no correlated peaks. It is shown that preset cyclic gating of AE signal processing during fatigue monitoring leads to unnecessary ambiguity in data interpretation. The temporal distribution technique reduces the ambiguity by reducing the effects of noise sources which are both correlated and uncorrelated to the fatigue stress cycle. The temporal distribution technique provides information which allows the manual, or software on-line adjustment of a cyclic gate (or temporal window). Author (ESA)

N82-22530# Rolls-Royce Ltd., Derby (England). Aero Div.

HIGH TEMPERATURE STRAIN GAUGING

J. Mathers 3 Apr. 1981 21 p refs

(PNR-90074) Avail: NTIS HC A02/MF A01

Strain gaging equipment and methods are discussed including: static and dynamic measurements up to 350C; dynamic measurements from 350 to 1000C; and static measurements > 350C. Gage alloys, bonding media, and leads were considered. For static strain measurements < 400C, copper-nickel, 'Advance' and nickel Karma alloys were available. Above 400C, large resistance changes and resistance temperature coefficient changes can occur. For dynamic strain, platinum-8% tungsten can be used up to 1000C, although metallurgical stability problems occur at high temperatures over long periods. A resin with installation life > 100hr at 300C, 20hr at 350C, and 5hr at 400C is reported. Above 350C ceramic cements of flame sprayed alumina were widespread. By using ceramic mounts and wheatstone bridges, gages could be used up to 600C. Gages built to operate above 600C are also described. Author (ESA)

N82-22531# Rolls-Royce Ltd., Derby (England).

INFLUENCE OF MICROSCOPIC INHOMOGENEITY OF PLASTIC DEFORMATION ON INITIATION OF FATIGUE CRACKS

Michael Graef 17 Jun. 1981 19 p refs Transl. into ENGLISH from Z. Metallkde. (West Germany), v. 70, no. 10, 1979 p 690-695 Partly in ENGLISH and GERMAN

(PNR-90077; Trans-15704/TLT-00828) Avail: NTIS HC A02/MF A01

The dependence of fatigue crack initiation on slip distributions in an Ni superalloy was investigated quantitively in standard deformation tests. A connection between the probability of the occurrence of high surface steps and the number of stress cycles up to crack initiation is noted. It is shown that with the definition of a critical step height and a model for its formation, the probability of the occurrence of initial cracks can be calculated and it is possible to correlate the results of investigations on the first stage of crack propagation in various alloys. Cracks are initiated at a high surface step by excessive stresses which reach theoretical limits at that point. Author (ESA)

N82-22532# Rolls-Royce Ltd., Derby (England).

FRACTURE MECHANISMS AND CRACK PROPAGATION IN CROSS-PLY LAMINATES TESTED BY THE SHORT BEAM SHEAR TECHNIQUE

J. W. Johnson 12 Apr. 1981 22 p refs Presented at Res. Meeting on Interfaces in Composites, Liverpool, England, 1-2 Apr. 1981

(PNR-90079) Avail: NTIS HC A02/MF A01

The origin of interlaminar shear (ILS) cracks in laminates is discussed. Scanning electron microscope observations of a short beam shear specimen of a cross plied carbon fiber reinforced plastic are reported. The fracture surface shows distinct crack propagation features associated with tension cracks which provides information on the origin and chronology of the failure. The strong intereaction between crossplied fibers which approach each other closely at the interface, and the way in which this interaction generates incipient transply cracks at the ply interface is emphasized. It is found that the near vicinity of fibers and unidentified flaws in the resin system contribute to crack initiation. Author (ESA)

N82-22533# Loughborough Univ. of Technology (England). Dept. of Transport Technology.

THE USE OF THE FINITE ELEMENT METHOD TO DEVELOP LIGHTER STRUCTURES FOR AUTOMATIVE USE

L. J. Page, R. Ali, P. W. Sharman, and A. Ancliff Dec. 1981 15 p refs

(TT-8103) Avail: NTIS HC A02/MF A01

The parameterization of a vehicle body shell, panel thickness optimization, finite element meshing, joining method efficiencies and the dynamics of vehicle body structures are discussed. Only totally redundant beams are identified by parameterization. The optimization program reduces stiffness matrices for assemblies of elements to a minimum size consistent with the degrees of freedom of nodes which connect with other structures. The mesh generator program only requires a mesh to be drawn on a picture of the structure. Adhesives give the least reduction in stiffness. Natural frequencies at 37 Hz (torsion) and 46 Hz (bending) are noted. The floor vibrates with modes at 50 and 56 Hz. The roof vibrates as a rigid body on the flexible pillars with modes at 45, 63 and 68 Hz. Author (ESA)

N82-22534# Rolls-Royce Ltd., Derby (England).

ALTERNATING STRESS MEASUREMENTS ON MODEL AND ACTUAL TURBINE BLADES

M. Glober and W. Maly Sep. 1981 28 p refs Transl. into ENGLISH from "Wechseldehnungsmessungen an modell-und Original-Turbinenschaufeln" Rept. VDI-313 West Germany p 343-351 Presented at the 6th Intern. Conf. on Exptl. Stress Anal., 1978

(PNR-90101; Trans-15784/TLT-00835; VDI-313) Avail: NTIS HC A03/MF A01

Methods of measuring the natural frequencies and dynamic stresses of axial turbine blades under operational conditions are described. Holographic interferometry, alternating stress disribution measurement, using strain gages, and natural frequency analysis on static blades and on rotating blades fitted with piezoelectric gages are discussed. Model turbines for determining nonsteady blade forces when guide vanes are partially impinged, a model of a low pressure turbine with trailer turbine, slip ring transmission measuring devices, and high frequency signal tests of blade vibration are treated. Model and actual steam turbine measurements show that dynamic stress reaches a minimum at output stage zero power. Amplitudes increase during ventilation operation. In the positive power range of the output stage the alternating bending stress increases in direct proportion to the static stress from the steam power. Author (ESA)

N82-22535# National Aerospace Lab., Amsterdam (Netherlands). Div. of Structures and Materials.

MATERIAL SELECTION AND DESIGN SAFETY AND DURABILITY OF OFFSHORE AND LITTORAL STRUCTURES

R. J. H. Wanhill Oct. 1980 30 p refs Presented at Stichting Mater. Onderzoek in de Zee (SMOZ) Ann. Meeting, Delft, 9 Dec. 1981

(NLR-MP-80040-U) Avail: NTIS HC A03/MF A01

The case for changing the design philosophy of offshore

and littoral structures by instituting fracture control is argued. Material selection processes are reviewed. The use of linear elastic fracture mechanics to characterize fracture and crack growth properties is described. Structural material selection criteria are given. Studies of structures which failed indicate that the safe-life philosophy is inadequate. Apart from impact notch strength, fracture related properties are not considered. The safe-crack growth approach does not permit in-service crack inspection. Fail-safe design is advocated. This can be achieved by regular inspection, providing multiple load paths so that damage can be contained when a load path fails, and incorporating crack arrestment features, e.g., tear strips. Author (ESA)

N82-22150# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
BUCKLING OF COMPOSITE STRUCTURES
R. Girard *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1981-5, Sep. - Oct. 1981 (ESA-TT-725) Feb. 1982 p 43-54 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), No. 1981-5, Sep. - Oct. 1981 (For primary document see N82-22145 13-01)
Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 45

42 GEOSCIENCES (GENERAL)

N82-22536*# SRI International Corp., Menlo Park, Calif.
LIDAR DETERMINATION OF THE COMPOSITION OF ATMOSPHERE AEROSOLS
M. L. Wright Feb. 1980 53 p refs
(Contract NAS2-10126)
(NASA-CR-166298; NAS 1.26:166298) Avail: NTIS HC A04/MF A01 CSCL 04A

Theoretical and experimental studies of the feasibility of using DIfferential SCatter (DISC) lidar to measure the composition of atmospheric aerosols are described. This technique involves multiwavelength measurements of the backscatter cross section of aerosols in the middle infrared, where a number of materials display strong restrahlen features that significantly modulate the backscatter spectrum. The theoretical work indicates that a number of materials of interest, including sulfuric acid, ammonium sulfate, and silicates, can be discriminated among with a CO2 lidar. An initial evaluation of this procedure was performed in which cirrus clouds and lower altitude tropospheric aerosols were developed. The observed ratio spectrum of the two types of aerosol displays structure that is in crude accord with theoretical expectations. Author

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N82-22537# Comptroller General of the United States, Washington, D.C.
STRATEGIC PETROLEUM RESERVE: SUBSTANTIAL PROGRESS MADE, BUT CAPACITY AND OIL QUALITY CONCERNS REMAIN Report to the Congress
31 Dec. 1981 63 p refs
(EMD-82-19; B-203117) Avail: SOD

During fiscal year 1981, the Government filled the Strategic Petroleum Reserve at an average rate of 292,000 barrels per day, the highest rate achieved for any fiscal year since oil fill began. Efforts since July 1980 to fill the reserve are discussed and it is noted that the Department of Energy will be able to maintain only an average rate of 189,000 barrels per day from fiscal year 1982 to 1989 under current expansion plans. Recommendations concerning the availability of storage capacity and the quality of oil stored in the reserve are given. T.M.

N82-22538*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
USER'S GUIDE TO THE UTIL-ODRC TAPE PROCESSING PROGRAM
S. M. Juba, Principal Investigator Aug. 1981 27 p ERTS
(Contract NAS9-15800)
(E82-10095; NASA-CR-167412; JSC-17585;
NAS 1.26:167412; LEMSCO-17151) Avail: NTIS HC A03/MF A01 CSCL 02C

The UTIL-ODRC computer compatible tape processing program, its input/output requirements, and its interface with the EXEC 8 operating system are described. It is a multipurpose orbital data reduction center (ODRC) tape processing program enabling the user to create either exact duplicate tapes and/or tapes in SINDA/HISTRY format. Input data elements for PRAMPT/FLOPLT and/or BATCH PLOT programs, a temperature summary, and a printed summary can also be produced. J.D.

N82-22539*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
AS-BUILT DESIGN SPECIFICATION FOR THE CLASFYT PROGRAM
C. L. Horton, Principal Investigator Jun. 1981 166 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10097; NASA-CR-161052; JSC-17370;
NAS 1.26:161052; SR-L1-00303; LEMSCO-16648) Avail: NTIS HC A08/MF A01 CSCL 02C

The CLASFYT program is described in detail. The program produces a one-channel universal-formatted classification file. Trajectory coefficients and a composite set of tolerance values are calculated from five acquisitions of radiance values in each of the training fields corresponding to up to ten agricultural products. These coefficients and tolerance values are used to classify each pixel in the test field of the same segment to be the same agricultural product as one of the training fields, none of the products or a screened pixel. M.G.

N82-22540*# Texas Univ. at Dallas. Center for Space Sciences.
INVESTIGATION OF THE EFFECTS OF EXTERNAL CURRENT SYSTEMS ON THE MAGSAT DATA UTILIZING GRID CELL MODELING TECHNIQUES Quarterly Status Technical Progress Report, 1 Jan. - 31 Mar. 1981
David M. Klumpar, Principal Investigator 6 Apr. 1981 15 p ERTS
(Contract NAS5-26309)
(E82-10098; NASA-CR-168405; NAS 1.26:168405; TPR-2)
Avail: NTIS HC A02/MF A01 CSCL 05B

Efforts devoted to reading MAGSAT data tapes in preparation for further analysis of the MAGSAT data are discussed. A modeling procedure developed to compute the magnetic fields at satellite orbit due to hypothesized current distributions in the ionosphere and magnetosphere is described. This technique utilizes a linear current element representation of the large-scale space-current system. Several examples of the model field perturbations computed along hypothetical satellite orbits are shown. T.M.

N82-22541*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
COMPUTER PROGRAM DOCUMENTATION FOR THE PATCH SUBSAMPLING PROCESSOR
M. J. Nieves, S. O. OBrien, and J. K. Oney, Principal Investigators Jan. 1981 210 p ref Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10099; NASA-CR-161040; JSC-16855; NAS
1.26:161040; EW-L1-00709; LEMSCO-15119) Avail: NTIS HC A10/MF A01 CSCL 02C

The programs presented are intended to provide a way to extract a sample from a full-frame scene and summarize it in a useful way. The sample in each case was chosen to fill a 512-by-512 pixel (sample-by-line) image since this is the largest image that can be displayed on the Integrated Multivariant Data Analysis and Classification System. This sample size provides one megabyte of data for manipulation and storage and contains

about 3% of the full-frame data. A patch image processor computes means for 256 32-by-32 pixel squares which constitute the 512-by-512 pixel image. Thus, 256 measurements are available for 8 vegetation indexes over a 100-mile square. T.M.

N82-22542*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

AGRISTARS: FOREIGN COMMODITY PRODUCTION FORECASTING. PROJECT PROCEDURES DESIGNATION AND DESCRIPTION DOCUMENT, VOLUME 1

J. T. Waggoner and D. E. Phinney, Principal Investigators Jun. 1981 120 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E82-10100; NASA-CR-161062; JSC-17154; NAS 1.26:161062; FC-L1-00715; LEMSCO-16852) Avail: NTIS HC A06/MF A01 CSCL 02C

The crop estimation analysis procedures documentation of the AgRISTARS - Foreign Commodity Production Forecasting Project (FCPF) is presented. Specifically it includes the technical/management documentation of the remote sensing data analysis procedures prepared in accordance with the guidelines provided in the FCPF communication/documentation standards manual. Standard documentation sets are given arranged by procedural type and level then by crop types or other technically differentiating categories. Author

N82-22543*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

AS-BUILT DESIGN SPECIFICATION FOR PARPLT

Mary Ann Tompkins and D. E. Cheng, Principal Investigators Jun. 1981 114 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E82-10101; NASA-CR-161053; JSC-17305; NAS 1.26:161053; SR-L1-00308; LEMSCO-16544) Avail: NTIS HC A06/MF A01 CSCL 02C

The design and implementation of the PARPLT program are described. The program produces scatter plots of the greenness profile derived parameters alpha, beta, and t sub o computed by the CLASFYG program (alpha being the approximate greenness rise time; beta, the greenness decay time; and t sub o, the spectral crop emergence date). Statistical information concerning the parameters is also computed. M.G.

N82-22544*# Montana State Univ., Bozeman. Dept. of Plant and Soil Science.

REVIEW OF LITERATURE RELATING TO THE MODELING OF SOIL TEMPERATURES BASED ON METEOROLOGICAL FACTORS

Joseph M. Caprio, Principal Investigator, Kent H. Sandefer, and Richard E. Lund Jul. 1981 94 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-16007; Proj. AgRISTARS)

(E82-10102; NASA-CR-161054; NAS 1.26:161054; EW-21-04124) Avail: NTIS HC A05/MF A01 CSCL 02C

Abstracts of 72 papers, journal articles, and other publications are presented. The applicabilities of each is assessed for use in improving winterkill parameters for a winter wheat model. E.A.K.

N82-22545*# Mississippi State Univ., Mississippi State. Mississippi Remote Sensing Center.

DISCRIMINATION OF UNIQUE BIOLOGICAL COMMUNITIES IN THE MISSISSIPPI LIGNITE BELT

W. Frank Miller, Principal Investigator and James D. Cutler Jul. 1981 57 p Sponsored by NASA ERTS

(E82-10103; NASA-CR-168504; NAS 1.26:168504) Avail: NTIS HC A04/MF A01 CSCL 08F

Small scale hardcopy LANDSAT prints were manually interpreted and color infrared aerial photography was obtained in an effort to identify and map large contiguous areas of old growth hardwood stands within Mississippi's lignite belt which do not exhibit signs of recent disturbance by agriculture, grazing, timber harvesting, fire, or any natural catastrophe, and which may, therefore, contain unique or historical ecological habitat types. An information system using land cover classes derived from digital LANDSAT data and containing information on geology, hydrology, soils, and cultural activities was developed. Using computer-assisted land cover classifications, all hardwood remnants in the study area which are subject to possible disturbance from surface mining were determined. Twelve rare plants were also identified by botanists. A.R.H.

N82-22546*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

WESTERN REGIONAL REMOTE SENSING CONFERENCE PROCEEDINGS, 1981

Sep. 1981 263 p refs Conf. held at Monterey, Calif., 30 Mar. - 2 Apr. 1981 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. Dak., 57198 ERTS

(E82-10104; NASA-CP-2195; NAS 1.55:2195; A-8663) Avail: NTIS HC A12/MF A01 CSCL 05A

Diverse applications of LANDSAT data, problem solutions, and operational goals are described by remote sensing users from 14 western states. The proposed FY82 federal budget reductions for technology transfer activities and the planned transition of the operational remote sensing system to NOAA's supervision are also considered. For individual titles, see N82-22547 through N82-22585.

N82-22547*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

OVERVIEW: WESTERN REGIONAL APPLICATIONS PROGRAM (WRAP) STATUS c93

Susan M. Norman *In its* Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 2-7 ERTS (For primary document see N82-22546 13-43)

Avail: NTIS HC A12/MF A01 CSCL 05B

Interactions with all 14 of the states in the Western Region over the past three years are reviewed from NASA's perspective. Outreach and training programs using the M mobile analysis and training extension van, the University Program, classes at the Ames Center, demonstration tests with state agencies, and surveying the needs of local governments are highlighted. Planned activities, the continuance of ASVT's, and the impact of the budget cuts on NASA'S technology program are also considered. A.R.H.

N82-22548*# National Aeronautics and Space Administration, Washington, D. C.

TECHNOLOGY TRANSFER PROGRAM: PERSPECTIVE

Alexander J. Toyshov *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc. 1981 Sep. 1981 p 8-12 ERTS (For primary document see N82-22546 13-43)

Avail: NTIS HC A12/MF A01 CSCL 05A

Most of NASA's technology transfer activities are in the area of land use (development, suitability, and planning); forestry (including wildlife and range and vegetation inventories) agriculture related activities; and water resources. The technology dissemination function is exercised through three regional applications centers which are involved in 91 applications projects within 22 states. In addition there are approximately eight application system verification transfer (ASVT) projects, 21 university applications branches, institutionalized liason activities with public interest groups, and user requirements activities. As the result of budget cuts, the ASVT and user requirements and awareness programs are to be phased out at the end of FY81. The university applications programs are to be phased down and terminated by 1985. NASA will continue to work with the user more in an R & D and an applications development capacity, and not in a national scale or administrative way. A.R.H.

N82-22549*# National Aeronautics and Space Administration, Washington, D. C.

NASA REMOTE SENSING PROGRAMS: OVERVIEW

William P. Raney *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 13-19 ERTS (For primary document see N82-22546 13-43)

Avail: NTIS HC A12/MF A01 CSCL 05A

In the Earth remote sensing area, NASA's three functions are to understand the basic mechanics and behavior of the Earth,

evaluate what resources are available (in the way of minerals, and hydrocarbons on a general scale), and to arrange a scheme for managing our national assets. The capabilities offered by LANDSAT D and technology improvements needed are discussed. The French SPOT system, its orbits, possibilities for stereo imagery, and levels of preprocessing and processing with several degrees of radiometric and geometric corrections are examined. Progress in the AgRISTARS project is mentioned as well as future R & D programs in the use of fluorescence, microwave measurements, and synthetic aperture radar. Other areas of endeaver include studying man environment interactions and Earth radiation budgets, and the establishment of data systems programs. A.R.H.

N82-22550*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

STATE RESOURCE MANAGEMENT AND ROLE OF REMOTE SENSING

Huey D. Johnson (Secretary for Resources, Sacramento, Calif.) *In its* Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 20-25 ERTS (For primary document see N82-22546 13-43)

Avail: NTIS HC A12/MF A01 CSCL 05A

Remote sensing by satellite can provide valuable information to state officials when making decisions regarding resources management. Portions of California's investment for Prosperity program which seem likely candidates for remote sensing include: (1) surveying vegetation type, age, and density in forests and wildlife habitats; (2) controlling fires through chaparal management; (3) monitoring wetlands and measuring ocean biomass; (4) eliminating ground water overdraught; (5) locating crops in overdraught areas, assessing soil erosion and the areas of poorly drained soils and those affected by salt; (6) monitoring coastal lands and resources; (7) changes in landscapes for recreational purposes; (8) inventorying irrigated lands; (9) classifying ground cover; (10) monitoring farmland conversion; and (11) supplying data for a statewide computerized farmlands data base. A.R.H.

N82-22551*# National Oceanic and Atmospheric Administration, Washington, D. C. User Affairs Office.

OPERATIONAL LANDSAT REMOTE SENSING SYSTEM DEVELOPMENT

Daniel J. Cotter *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 26-29 ERTS (For primary document see N82-22546 13-43)

Avail: NTIS HC A12/MF A01 CSCL 14B

The reduction of $121.6 million dollars from NOAA's LANDSAT development program for FY 1982, and the shortened time period for transferring remote sensing technology to the private sector resulted in changes in the Agency's plans for managing the operational system. Proposed legislation for congressional consideration or enactment to establish conditions under which this private sector transfer will occur, and the expected gradual rise in the price of data products are discussed. No money exists for capital investment and none is projected for investing in an operational data handling system for the LANDSAT D satellite. Candidates knowledgeable of various aspects of the needs and uses of remote sensing are urged to consider participation in NOAA's advisory committee. A.R.H.

N82-22552*# Economics, Statistics and Cooperatives Service, Washington, D. C. Remote Sensing Branch.

USDA/FEDERAL USER OF LANDSAT REMOTE SENSING

Richard Allen *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 30-36 ERTS (For primary document see N82-22546 13-43)

Avail: NTIS HC A12/MF A01 CSCL 05B

Developed and potential uses of remote sensing in crop condition and acreage assessment, renewable resources inventories, conservation practices, and water and forest management applications are described. Operational approaches, the adaptation of procedures to needs, and the agency's concern about data continuity and cost are discussed as well as support for future technology development for enhanced sensing capability. The use of improved camera systems for soil mapping and conservation monitoring from space shuttle, and of aerospace radar to improve soil moisture monitoring are mentioned. A.R.H.

N82-22553*# Office of the Governor of the State of Alaska, Juneau. Div. of Policy Development and Planning.

REMOTE SENSING IN ALASKA: OPPORTUNITIES AND POLICY IMPLICATIONS

Jay H. Moor *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 43-48 ERTS (For primary document see N82-22546 13-43)

Avail: NTIS HC A12/MF A01 CSCL 05A

The natural resources of Alaska and their exploitation and further development are discussed. the use of remote sensing techniques for vegetation classification, wetlands identification, and other basic resource management techniques is assessed and the history of cooperation between state and federal land managers is reviewed. Agencies managing resources in Alaska are encountered to use existing forums to develop a coordinated program aimed at improving all resource management capabilities. Continuing education, training, demonstrations and evaluations must be provided to enhance management abilities and promote social and economic development in the state. E.A.K.

N82-22554*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

INTERGOVERNMENTAL SCIENCE/ENGR/TECH ADVISORY PANEL (ISETAP): OVERVIEW

Leonard Slosky (Assistant to the Governor, Denver) *In its* Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 49-51 ERTS (For primary document see N82-22546 13-43)

Avail: NTIS HC A12/MF A01 CSCL 05B

Major constraints to the utilization of LANDSAT by state governments are identified. Six recommendations are made: (1) commitment by the federal government to assure LANDSAT data continuity and compatibility; (2) federal support of LANDSAT system; (3) federal agency responsibility should be clearly defined; (4) commitment by the federal government to prior consultation with the state in LANDSAT decisions; (5) commitment by the federal government to systematic and ongoing technology transfer programs; and (6) improvement of the data processing and delivery system. The transfer of technology from NOAA to the private sector and its impact on the state governments utilizing LANDSAT are also discussed. E.A.K.

N82-22555*# Utah Geological and Mineralogical Survey, Salt Lake City.

IMPLEMENTING AUTOMATIC GEOGRAPHIC REFERENCING IN UTAH

Bruce L. Plott *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 53-55 ERTS (For primary document see N82-22546 13-43)

Avail: NTIS HC A12/MF A01 CSCL 08F

Efforts to use a fully integrated approach to remote sensing in Utah include a realization that data and information are also resources to be managed. A possibility that information acquired for a specific use such as geological application may be of use to others, for instance, to the highway department. Utah is trying to establish a core operation within the state to make some upfront investment in hardware, software, and technical expertise, sufficient to make the operational people in the field aware of what can be done. The key to the operation is to facilitate, coordinate, and educate, so agencies can act for themselves based on their needs, desires, capabilities, and budget. E.A.K.

N82-22556*# National Conference of State Legislatures, Denver, Colo. Remote Sensing Project.

STATE/FEDERAL INTERACTION OF LANDSAT SYSTEM AND RELATED TECHNICAL ASSISTANCE

Paul A. Tesser *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 56-63 ERTS (For primary document see N82-22546 13-43)

Avail: NTIS HC A12/MF A01 CSCL 05A

The history of state involvement in LANDSAT systems planning and related efforts is described. Currently 16 states have visual LANDSAT capabilities and 10 others are planning on developing such capabilities. The federal government's future plans for the LANDSAT system, the impacts of recent budget decisions on the systems, and the FY 82 budget process are examined. E.A.K.

N82-22557*# Earth Satellite Corp., Berkeley, Calif. Forestry Applications.
MULTIRESOURCE ANALYSIS AND INFORMATION SYSTEM CONCEPTS FOR INCORPORATING LANDSAT AND GIS TECHNOLOGY INTO LARGE AREA FOREST SURVEYS
Philip G. Langley *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 64-65 ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 02F

A method of relating different classifications at each stage of a multistage, multiresource inventory using remotely sensed imagery is discussed. A class transformation matrix allowing the conversion of a set of proportions at one stage, to a set of proportions at the subsequent stage through use of a linear model, is described. The technique was tested by applying it to Kershaw County, South Carolina. Unsupervised LANDSAT spectral classifications were correlated with interpretations of land use aerial photography, the correlations employed to estimate land use classifications using the linear model, and the land use proportions used to stratify current annual increment (CAI) field plot data to obtain a total CAI for the county. The estimate differed by 1% from the published figure for land use. Potential sediment loss and a variety of land use classifications were also obtained. J.D.

N82-22558*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT 2, 3, AND D Status Report
Vincent V. Salomonson *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 68-76 ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 05A

The history and operational status of the LANDSAT satellites and processing of LANDSAT imagery are summarized. Multispectral band scanner (MSS) data from LANDSAT 2 are being provided by recorders placed at several foreign ground stations. Return beam vidicon data are being received from LANDSAT 3. Processing and delivery of these data is improving, with disappearance of the backlog projected for 1982. The acquisition of MSS data and data from the thematic mapper (TM) is expected from LANDSAT D, with transfer of MSS data to NOAA projected for 1983 and TM data for 1985. J.D.

N82-22559*# Nevada Div. of Forestry, Carson City.
COOPERATIVE FORESTRY INVENTORY PROJECT FOR NEVADA
Ronan Thornhill *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 82-84 ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 02F

A forest inventory project employing computerized classification of LANDSAT data to inventory vegetation types in western Nevada is described. The methodology and applicability of the resulting survey are summarized. J.D.

N82-22560*# California Dept. of Conservation, Sacramento. Dept. of Forestry.
PRESENT/FUTURE CALIFORNIA DEPARTMENT OF FORESTRY REMOTE SENSING ACTIVITIES
Nancy Tosta-Miller *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 85-86 ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 02F

The utilization of LANDSAT data in forestry inventories in California is summarized. Problems in selecting meaningful classification systems, utilization of supervised or unsupervised classification systems, and data smoothing are discussed. J.D.

N82-22561*# Forest Service, Nevada City, Calif.
REMOTE SENSING/VEGETATION CLASSIFICATION
Ivan E. Parker *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 87-92 refs ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 02C

The CALVEG classification system for identification of vegetation is described. This hierarchical system responds to classification requirements and to interpretation of vegetation at various description levels, from site description to broad identification levels. The system's major strength is its flexibility in application of remote sensing technology to assess, describe and communicate data relative to vegetative resources on a state-wide basis. It is concluded that multilevel remote sensing is a cost effective tool for assessment of the natural resource base. The CLAVEG system is found to be an economically efficient tool for both existing and potential vegetation. E.A.K.

N82-22562*# Washington State Dept. of Natural Resources, Olympia.
FIRST DOWN AND GOAL TO GO
Gene Little *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 93-97 ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 08F

A 10 year game plan for transition to the operational system was developed in the State of Washington. The plan is to: examine the results of past demonstration projects to identify successful operational applications, take advantage of geographic information systems, and work toward reducing/eliminating constraints of the present system which inhibit operational use. Support for the LANDSAT program was demonstrated by sending a user representative to NOAA working in the development of a user oriented system. It is suggested that the state should reassess its position, by taking advantage of the past 8 years' experience, and coordinate efforts to enhance LANDSAT' advantages in a cost effective manner. E.A.K.

N82-22563*# Arizona Dept. of Water Resources, Phoenix.
APPLICATION OF REMOTE SENSING TECHNIQUES FOR IDENTIFICATION OF IRRIGATED CROP LANDS IN ARIZONA
Howard A. Billings *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 98-100 ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 02C

Satellite imagery was used in a project developed to demonstrate remote sensing methods of determining irrigated acreage in Arizona. The Maricopa water district, west of Phoenix, was chosen as the test area. Band rationing and unsupervised categorization were used to perform the inventory. For both techniques the irrigation district boundaries and section lines were digitized and calculated and displayed by section. Both estimation techniques were quite accurate in estimating irrigated acreage in the 1979 growing season. E.A.K.

N82-22564*# California State Dept. of Water Resources, Sacramento. Water Conservation and Use Section.
AN INVENTORY OF CALIFORNIA'S IRRIGATED LAND
Glenn B. Sawyer *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 100-101 ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 08B

Currently in the fourth year of its applications pilot test project to assess irrigated lands for water management, California officials found that the performance goal of plus or minus 5% at the 95% confidence level by each of the state's 10 major hydrologic basins was bettered in all but a few cases using manual analysis techniques for estimation. The process used was photointerpretation of enlarged LANDSAT scenes (1:150,000 scale), adjusting the determined acreage using a regression estimator and ground truth data from 637 sample cells. Sample cells were allocated to areas stratified on the basis of field size and selected crop types. Interpretation of three dates of imagery was required to span the complete time during which irrigated crops are grown in California. The registration of multitemporal data and classification procedures for estimating irrigated land using digital techniques are being studied as part of the second task in the project. A.R.H.

N82-22565*# Idaho Dept. of Water Resources, Boise. Idaho Image Analysis Facility.
APPLICATIONS OF DIGITAL IMAGE ANALYSIS CAPABILITY IN IDAHO
Kim A. Johnson *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 102-105 ERTS (For primary document see N82-22546 13-43)

Avail: NTIS HC A12/MF A01 CSCL 08B

The use of digital image of LANDSAT imagery in water resource assessment is discussed. The data processing systems employed are described. The determination of urban land use conversion of agricultural land in two southwestern Idaho counties involving estimation and mapping of crop types and of irrigated land is described. The system was also applied to an inventory of irrigated cropland in the Snake River basin and establishment of a digital irrigation water source/service area data base for the basin. Application of the system to a determination of irrigation development in the Big Lost River basin as part of a hydrologic survey of the basin is also described. J.D.

N82-22566*# Washington Univ., Seattle. Lab. for Remote Sensing Applications.

LAND COVER CLASSIFICATION FOR PUGET SOUND, 1974-1979

James R. Eby *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 106-109 ERTS (For primary document see N82-22546 13-43)

Avail: NTIS HC A12/MF A01 CSCL 13B

Digital analysis of LANDSAT data for land cover classification projects in the Puget Sound region is surveyed. Two early rural and urban land use classifications and their application are described. After acquisition of VICAR/IBIs software, another land use classification of the area was performed, and is described in more detail. Future applications are considered. J.D.

N82-22567*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

UPDATING CENSUS URBAN AREA MAPS WITH LANDSAT DATA

Steven Z. Friedman *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 110-118 ERTS (For primary document see N82-22546 13-43)

Avail: NTIS HC A12/MF A01 CSCL 08B

The use of LANDSAT data for updating census maps of urbanized areas by identification of a fringe of suburban territory to be considered for inclusion within a revised urban area map is described. Methodologies of the application system verification and transfer project are evaluated. These include manual analysis of color photographs, line printer maps, and land cover classifications; change detection using an image differencing routine to depict changes in reflectance values between the two anniversary LANDSAT images; and use of the IBIS/VICAR digital image processing system. Application of IBIS/VICAR to mapping the Orlando, Florida area is described in detail. J.D.

N82-22568*# Bureau of Land Management, Denver, Colo.

VERIFICATION OF LAND COVER MAPS FROM LANDSAT DATA

David S. Linden and John Szajgin *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 119-125 ERTS (For primary document see N82-22546 13-43)

Avail: NTIS HC A12/MF A01 CSCL 08B

The application of cluster sampling to verifying the accuracy of maps derived from digital data is discussed. Variants of the cluster sampling technique were used in large scale assessments for areas in excess of one million hectares. Three types of classification errors are possible: commission errors, omission errors, and overall error classification. Commission errors for a particular cover type occur when pixels are classified as that cover type but are found to be some other cover type when the field is checked. Omission errors occur when pixels of fields already visited and known to be of a particular cover type, are classified as some other cover type. Overall error is the proportion of pixels incorrectly classified, without regard to omission or commission. Since the classified image represents the sampling frame, sampling for accuracy assessment was designed to estimate commission error. However, the sample can also provide useful estimates of omission and overall error. Assessment for Alaska, Arizona, and Oklahoma are presented. T.M.

N82-22569*# EROS Data Center, Sioux Falls, S. Dak. Bioscience Section.

REMOTE SENSING APPLICATIONS FOR RANGE MANAGEMENT

Robert H. Haas *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc. 1981 Sep. 1981 p 126-129 ERTS (For primary document see N82-22546 13-43)

Avail: NTIS HC A12/MF A01 CSCL 06C

The use of satellite information for range management is discussed. The use of infrared photography and color photography for analysis of vegetation cover is described. The methods of interpreting LANDSAT imagery are highlighted and possible applications of such interpretive methods to range management are considered. The concept of using LANDSAT as a sampling frame for renewable natural resource inventories was examined. It is concluded that a blending of LANDSAT vegetation data with soils and digital terrain data, will define a basic sampling unit that is appropriate for range management utilization. T.M.

N82-22570*# Electromagnetic Systems Labs., Inc., Sunnyvale, Calif.

COMBINING LANDSAT MSS, AERIAL PHOTOGRAPHS AND GROUND MEASUREMENTS TO ESTIMATE RANGELAND PRODUCTIVITY

Michale J. Gialdini *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 130-132 ERTS (For primary document see N82-22546 13-43)

Avail: NTIS HC A12/MF A01 CSCL 08F

The production of a vegetation map of over 2.2 million acres with detail down to the plant community level, and the production of estimates of rangeland productivity (pounds of usable forage per acre for cattle) for a 500,000 acre subset of area with a design goal for accuracy and precision of + or - 20% at the 80% confidence level, are considered. The data consist of five groups: maps of area, LANDSAT data, digital terrain data, large scale aerial photography, and ground plots. An outline of the data acquisition and data reduction schemes are presented. T.M.

N82-22571*# Alaska Univ., Fairbanks. Northern Remote Sensing Lab.

REINDEER RANGES INVENTORY IN WESTERN ALASKA

Thomas H. George *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 133-137 Original contains Imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS (For primary document see N82-22546 13-43)

Avail: NTIS HC A12/MF A01 CSCL 08F

The use of LANDSAT data as a tool for reindeer range inventory on the tundra of northwestern Alaska is addressed. The specific goal is to map the range resource and estimate plant productivity of the Seward Peninsula. Information derived from these surveys is needed to develop range management plans for reindeer herding and to evaluate potential conflicting use between reindeer and caribou. The development of computer image classification techniques is discussed. M.G.

N82-22572*# Oregon State Univ., Corvallis. Environmental Remote Sensing Lab.

APPLICATION OF LANDSAT MSS TO ELK HABITAT MANAGEMENT

Barry J. Schrumpf *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 138-139 ERTS (For primary document see N82-22546 13-43)

Avail: NTIS HC A12/MF A01 CSCL 08B

The utilization of information derived from LANDSAT multispectral scanner data to estimate the impact of proposed timber harvests on potential elk use is briefly discussed. The evaluations were conducted in Northeastern Oregon where several herds of Rocky Mountain elk range in the Blue Mountains. The inventory product is a geographically referenced data base containing land cover types and habitat components (cover/forage). M.G.

N82-22573*# Idaho Dept. of Water Resources, Boise.

THE PACIFIC NORTHWEST STORY

Kim A. Johnson, Barry J. Schrumpf (Oregon State Univ., Corvallis), and Luke Krebs (Washington State Univ., Pullman) *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 140-144 ERTS (For primary document see N82-22546 13-43)

Avail: NTIS HC A12/MF A01 CSCL 05B

The establishment of image analysis facilities for the operational utilization of LANDSAT data in Idaho, Oregon, and Washington is discussed. The hardware and software resources are described for each facility along with the range of services. M.G.

N82-22574*# Environmental Systems Research Inst., Redlands, Calif.
ESRI APPLICATIONS OF GIS TECHNOLOGY: MINERAL RESOURCE DEVELOPMENT
William Derrenbacher *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 144-145 ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 08F

The application of geographic information systems technology to large scale regional assessment related to mineral resource development, identifying candidate sites for related industry, and evaluating sites for waste disposal is discussed. Efforts to develop data bases were conducted at scales ranging from 1:3,000,000 to 1:25,000. In several instances, broad screening was conducted for large areas at a very general scale with more detailed studies subsequently undertaken in promising areas windowed out of the generalized data base. Increasingly, the systems which are developed are structured as the spatial framework for the long-term collection, storage, referencing, and retrieval of vast amounts of data about large regions. Typically, the reconnaissance data base for a large region is structured at 1:250,000 scale, data bases for smaller areas being structured at 1:25,000, 1:50,000 or 1:63,360. An integrated data base for the coterminous US was implemented at a scale of 1:3,000,000 for two separate efforts. M.G.

N82-22575*# Environmental Systems Research Inst., Redlands, Calif.
LANDSAT DEMONSTRATION/APPLICATION AND GIS INTEGRATION IN SOUTH CENTRAL ALASKA
Anthony W. Burns (Municipality of Anchorage, Alaska) and William Derrenbacher *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 146-151 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 05B

Automated geographic information systems were developed for two sites in Southcentral Alaska to serve as tests for both the process of integrating classified LANDSAT data into a comprehensive environmental data base and the process of using automated information in land capability/suitability analysis and environmental planning. The Big Lake test site, located approximately 20 miles north of the City of Anchorage, comprises an area of approximately 150 square miles. The Anchorage Hillside test site, lying approximately 5 miles southeast of the central part of the city, extends over an area of some 25 square miles. Map construction and content is described. M.G.

N82-22576*# Idaho Dept. of Water Resources, Boise. Remote Sensing Unit.
IMAGE DISPLAY SYSTEM 511
Mark Gross *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 155-159 ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 09B

The experience of the Idaho Department of Water Resources Remote Sensing Unit in bringing on line their System 511 is described. The system 511 is run on a PDP minicomputer. The minimum system hardware configuration is an 11/34 with a minimum core of 128 K word, 10 megabytes of direct access disk and a floating point processor. The required software configuration is an RSX 11M V 3.2 operating system with a FORTRAN IV plus compiler. The structure of System 511 is a series of hierarchical modular software units. Problems occurring during the systems installation are discussed, and the system operating and error detection capabilities and documentation evaluated. J.D.

N82-22577*# Geological Survey, Anchorage, Alaska. EROS Field Office.
INTERACTIVE DIGITAL IMAGE MANIPULATION SYSTEM (IDIMS)
Michael D. Fleming *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 160-162 ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 09B

The implementation of an interactive digital image manipulation system (IDIMS) is described. The system is run on an HP-3000 Series 3 minicomputer. The IDIMS system provides a complete image geoprocessing capability for raster formatted data in a self-contained system. It is easily installed, documentation is provided, and vendor support is available. J.D.

N82-22578*# Washington State Univ., Pullman.
VIDEO INFORMATION COMMUNICATION AND RETRIEVAL/IMAGE BASED INFORMATION SYSTEM (VICAR/IBIS)
David B. Wherry *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 163-171 ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 05B

The acquisition, operation, and planning stages of installing a VICAR/IBIS system are described. The system operates in an IBM mainframe environment, and provides image processing of raster data. System support problems with software and documentation are discussed. J.D.

N82-22579*# South Carolina Univ., Columbia. Computer Services Div.
EARTH RESOURCES LABORATORY APPLICATIONS SOFTWARE (ELAS)
Thomas W. Balcerek *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 172-174 ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 09B

Implementation of the Earth Resources Laboratory applications software (ELAS) system is described. A Data General Eclipse model S/230 minicomputer is employed for image processing of LANDSAT data. A 16 bit word is used, and the smaller addressability necessitates reducing some of the array sizes. All INTEGER*4 variables were changed to REAL. Interfacing the ELAS software to Data General's FORTRAN callable runtime routines required rewriting the input/output routines and the subroutines that bring in the various overlays. Overlay relinking is required when a change is made in resident routines. The ELAS system and its user documentation is evaluated. J.D.

N82-22580*# Colorado Dept. of Local Affairs, Denver.
THE STATE AGENCY EXPERIENCE (EVALUATION/SELECTION OF HARDWARE FOR AUTOMATED, GEO-BASED INFORMATION SYSTEMS)
Louis F. Campbell, Jr. *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., Sep. 1981 p 175-178 ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 09B

The purpose and format of a panel session that addressed the procedures by which the hardware components of geographic information systems are evaluated and selected are described. State agencies from Alaska, Colorado, Montana, and Washington were represented and the topic was discussed within the general context of information requirements in land management decision making. M.G.

N82-22581*# Alaska Dept. of Natural Resources, Anchorage. **c44**
THE ALASKA EXPERIENCE
Douglas L. Mutter *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 179-185 ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 05B

The management responsibilities of the Alaska Department of Natural Resources are summarized and the establishment of a geoprocessor system is described. Specific capabilities were defined based on surveys of potential users and pre-existing systems. The procurement process, the initially purchased equipment, and system upgrading are described. Cost, installation and maintenance, site location, training, and staffing of the system are examined. M.G.

N82-22582*# Montana Dept. of Community Affairs, Helena.
THE MONTANA EXPERIENCE

Thomas R. Dundas *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 186-188 ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 05B

The development and capabilities of the Montana geodata system are discussed. The system is entirely dependent on the state's central data processing facility which serves all agencies and is therefore restricted to batch mode processing. The computer graphics equipment is briefly described along with its application to state lands and township mapping and the production of water quality interval maps. M.G.

N82-22583*# Colorado Dept. of Local Affairs, Denver.
THE COLORADO EXPERIENCE (EVALUATION AND SELECTION OF HARDWARE FOR AUTOMATED, GEO-BASED INFORMATION SYSTEMS)
David Sonnenl *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 189-194 ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 05B

A turnkey system which gives technical assistance to legislative redistricting and state census data affiliate activities is described. The procedures followed for the acquisition of the Colorado automated census mapping system are presented. Price and performance criteria of the system were examined and the system architecture is outlined. T.M.

N82-22584*# Washington State Dept. of Natural Resources, Olympia.
THE WASHINGTON EXPERIENCE (EVALUATION AND SELECTION OF HARDWARE FOR AUTOMATED GEO-BASED INFORMATION SYSTEMS)
Roger A. Harding *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 195-199 ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 05B

A Washington geographic information system is described. The system has thrust from two different angles: the proprietary need for information to support the management of five million acres of thrust lands by the Department of Natural Resources, and the need for data over the entire state because of statewide governmental responsibilities. The data base includes information relevant to agricultural, forest, industrial, business, and community growth with emphasis on assembling information useful in setting intermediate and long-range goals. System selection procedures and system feasibility studies are discussed. T.M.

N82-22585*# Aerial Information Systems, Crestline, Calif.
APPROPRIATENESS IN USING LANDSAT IN DEVELOPMENT ENERGY RELATED DATA BASES
Eric Harnden *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 205-209 ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 05B

The use of automated classification systems in the field of resource management and resource inventory is discussed. Applications of LANDSAT classification are outlined and include: energy load forecasting based upon land use inventories and change analysis, impact analysis of activities related to energy extraction, capability/suitability mapping in support of generation and substation location and transmission line routing, and assessment of solar energy potential in a highly urbanized setting where land values are high. It is found that the use of LANDSAT data is adequate for general inventories where few data categories are required, where resolution of data to around 150 acres minimum is required, and where no other complete imagery set can be obtained. T.M.

N82-22586*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
INCORPORATING SPATIAL CONTEXT INTO STATISTICAL CLASSIFICATION OF MULTIDIMENSIONAL IMAGE DATA
M. E. Bauer, Principal Investigator, James C. Tilton, and Philip H. Swain Aug. 1981 102 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15466; Proj. AgRISTARS)
(E82-10106; NASA-CR-167455; NAS 1.26:167455; SR-P1-04148; LARS-072981) Avail: NTIS HC A06/MF A01 CSCL 02C

Compound decision theory is employed to develop a general statistical model for classifying image data using spatial context. The classification algorithm developed from this model exploits the tendency of certain ground-cover classes to occur more frequently in some spatial contexts than in others. A key input to this contextural classifier is a quantitative characterization of this tendency: the context function. Several methods for estimating the context function are explored, and two complementary methods are recommended. The contextural classifier is shown to produce substantial improvements in classification accuracy compared to the accuracy produced by a non-contextural uniform-priors maximum likelihood classifier when these methods of estimating the context function are used. An approximate algorithm, which cuts computational requirements by over one-half, is presented. The search for an optimal implementation is furthered by an exploration of the relative merits of using spectral classes or information classes for classification and/or context function estimation. Author

N82-22587*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RADIOMETRIC MEASUREMENTS OVER BARE AND VEGETATED FIELDS AT 1.4 GHz AND 5 GHz FREQUENCIES
J. R. Wang, J. E. McMurtrey, III, E. T. Engman, T. J. Jackson, T. J. Schmugge, W. I. Gould, W. S. Glazar, and J. E. Fuchs, Principal Investigators Jun. 1981 28 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Prepared in cooperation with Dept. of Agriculture, Beltsville, Md. ERTS
(Proj. AgRISTARS)
(E82-10110; NASA-TM-82151; NAS 1.15:82151; SM-G1-04113) Avail: NTIS HC A03/MF A01 CSCL 20F

Microwave emission from bare and vegetated fields was measured with dual polarized radiometers at 1.4 GHz and 5 GHz frequencies. The measured brightness temperatures over bare fields are shown to compare favorably with those calculated from radiative transfer theory with two constant parameters characterizing surface roughness effect. The presence of vegetation cover is found to reduce the sensitivity to soil moisture variation. This sensitivity reduction is generally pronounced the denser, the vegetation cover and the higher the frequency of observation. The effect of vegetation cover is also examined with respect to the measured polarization factor at both frequencies. With the exception of dry corn fields, the measured polarization factor over vegetated fields is found appreciably reduced compared to that over bare fields. A much larger reduction in this factor is found at 5GHz than at 1.4GHz frequency. A.R.H.

N82-22588*# Commerce Dept., Houston, Tex.
UTILIZATION OF METEOROLOGICAL SATELLITE IMAGERY FOR WORLD-WIDE ENVIRONMENTAL MONITORING THE LOWER MISSISSIPPI RIVER FLOOD OF 1979-CASE 1
Michael R. Helfert, Dee G. McCrary, and Thomas I. Gray, Principal Investigators May 1981 30 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS
(Proj. AgRISTARS)
(E82-10113; NASA-CR-161026; NAS 1.26:161026; EW-N1-04104; JSC-17144) Avail: NTIS HC A03/MF A01 CSCL 08H

The 1979 Lower Mississippi River flood was selected as a test case of environmental disaster monitoring utilizing NOAA-n imagery. A small scale study of the St. Louis Missouri area comparing ERTS-1 (LANDSAT) and NOAA-2 imagery and flood studies using only LANDSAT imagery for mapping the Rad River of the North, and Nimbus-5 imagery for East Australia show the nonmeteorological applications of NOAA satellites. While the level of NOAA-n imagery detail is not that of a LANDSAT image, for operational environmental monitoring users the NOAA-n imagery may provide acceptable linear resolution and spectral isolation. E.A.K.

N82-22589*# Department of Agriculture, Houston, Tex.
ENVIRONMENTAL FACTORS DURING SEED DEVELOPMENT AND THEIR INFLUENCE ON PRE-HARVEST SPROUTING IN WHEAT
Allan J. Ciha, Principal Investigator May 1981 22 p refs Sponsored by NASA, USDA, Dept of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E82-10114; NASA-CR-161015; JSC-17157; NAS 1.26:161015; EW-U1-04115) Avail: NTIS HC A02/MF A01 CSCL 02C

The problem of pre-harvest sprouting of wheat is surveyed and a literature review of the effects of environmental conditions on pre-harvest sprouting is presenting. Physiological, biochemical, and morphological changes occurring within the wheat seed during germination, harvest, and storage are discussed. The effects of moisture, humidity, and temperature, particularly on seed dormancy, are considered. Procedures used in Europe for predicting the potential for sprouting are evaluated. J.D.

N82-22590*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
PROBABILISTIC CLUSTER LABELING OF IMAGERY DATA
C. B. Chittineni, Principal Investigator Sep. 1980 44 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10119; NASA-CR-160886; JSC-16384; NAS 1.26:160886; SR-LO-00483; LEMSCO-15358) Avail: NTIS HC A03/MF A01 CSCL 05B

The problem of obtaining the probabilities of class labels for the clusters using spectral and spatial information from a given set of labeled patterns and their neighbors is considered. A relationship is developed between class and clusters conditional densities in terms of probabilities of class labels for the clusters. Expressions are presented for updating the a posteriori probabilities of the classes of a pixel using information from its local neighborhood. Fixed-point iteration schemes are developed for obtaining the optimal probabilities of class labels for the clusters. These schemes utilize spatial information and also the probabilities of label imperfections. Experimental results from the processing of remotely sensed multispectral scanner imagery data are presented. Author

N82-22591*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PRELIMINARY TECHNICAL RESULTS REVIEW OF FY81 EXPERIMENTS. VOLUME 1: FISCAL YEAR 1981/82 SPRING SMALL GRAINS PILOT EXPERIMENT
28 Sep. 1981 259 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E82-10120; NASA-TM-84157; JSC-17433-Vol-1; NAS 1.15:84157; FC-J1-04175) Avail: NTIS HC A12/MF A01 CSCL 02C

Technical progress made in the foreign commodity production forecasting for the advancement of spring small grains (SSG) area estimation is reported with emphasis on results achieved since the last AgRISTARS level semiannual review. Major objectives and accomplishments are reviewed and the experiment is described. The technical approach data assessment, and data systems used are considered. Results of the group approach comparison study are presented along with preliminary aggregation results for SSG processing procedures. The outlook for the future is assessed. A.R.H.

N82-22592*# Department of Agriculture, Houston, Tex.
AN EMPIRICAL, GRAPHICAL, AND ANALYTICAL STUDY OF THE RELATIONSHIP BETWEEN VEGETATION INDICES
Lyle F. Lautenschlager and Charles R. Perry, Jr., Principal Investigators Oct. 1981 138 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior and Agency for International Development ERTS
(Proj. AgRISTARS)
(E82-10121; NASA-CR-167476; JSC-17425; NAS 1.26:167476; EW-J1-04150) Avail: NTIS HC A07/MF A01 CSCL 02C

The development of formulae for the reduction of multispectral scanner measurements to a single value (vegetation index) for predicting and assessing vegetative characteristics is addressed. The origin, motivation, and derivation of some four dozen vegetation indices are summarized. Empirical, graphical, and analytical techniques are used to investigate the relationships among the various indices. It is concluded that many vegetative indices are very similar, some being simple algebraic transforms of others. M.G.

N82-22593*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
GROUND REGISTRATION OF DATA FROM AN AIRBORNE MULTIFREQUENCY MICROWAVE RADIOMETER (MFMR)
John C. Richter, Principal Investigator Oct. 1981 29 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10124; NASA-CR-167449; JSC-17152; NAS 1.26:167449; SM-L1-04118; LEMSCO-16800) Avail: NTIS HC A03/MF A01 CSCL 05B

The agricultural soil moisture experiment was conducted near Colby, Kansas, in July and August 1978. A portion of the data collected was taken with a five band microwave radiometer. A method of locating the radiometer footprints with respect to a ground based coordinate system is documented. The procedure requires that the airplane's flight parameters along with aerial photography be acquired simultaneously with the radiometer data. The software which documented reads in data from the precision radiation thermometer (PRT Model 5) and attaches the scene temperature to the corresponding multifrequency microwave radiometer data. Listings of the programs used in the registration process are included. Author

N82-22594*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
AGRISTARS: FOREIGN COMMODITY PRODUCTION FORECASTING. COUNTRY SUMMARY REPORT, AUSTRALIA
D. L. Henninger and C. R. Reed, Principal Investigators Jul. 1981 92 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Prepared in cooperation with NASA, Johnson Space Center ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10125; NASA-CR-167398; JSC-17140; NAS 1.26:167398; LEMSCO-16645; FC-L1-04097) Avail: NTIS HC A05/MF A01 CSCL 02C

Australia is one of the world's major growers and exporters of wheat and as such is one of the countries of interest in the AgRISTARS program which endeavors to develop technology to estimate crop production using aerospace remote sensing. A compilation of geographic, political, and agricultural information on Australia is presented. Also included is a summary of the aerospace remote sensing, meteorological, and ground-observed data which were collected with respect to Australia, as well as a summary of contacts between AgRISTARS and Australia personnel. T.M.

N82-22595*# Energy, Mines and Resources Canada, Ottawa (Ontario). Geomagnetic Service.
THE REDUCTION, VERIFICATION AND INTERPRETATION OF MAGSAT MAGNETIC DATA OVER CANADA Progress Report
R. L. Coles, Principal Investigator, E. Dawson, G. V. Haines, G. Jansen vanBeek, J. K. Walker, and L. R. Newitt Mar. 1981 8 p Sponsored by NASA ERTS
(E82-10130; NASA-CR-168514; NAS 1.26:168514; PR-2) Avail: NTIS HC A02/MF A01 CSCL 05B

Procedures were established to select quiet, least-disturbed MAGSAT data in an effort to study the magnetic field originating in the solid Earth. A preliminary map of scalar field anomalies over Canada and adjacent regions was produced. Data from Fort Churchill magnetic observatory (an auroral zone station) were used in classifying MAGSAT passes as quiet, unsettled, or disturbed. Determinations of long-term quiet levels at Canadian

magnetic observatories are being made. For the time interval of each MAGSAT pass, the deviations of the mean hourly values of the magnetic field components are determined from these quiet levels, in particular for Fort Churchill. Primary processing all CHRONINT tapes received to date, involved decoding orbit records, decimating data records, selecting time intervals and latitude intervals, and producing output tapes carrying records with data point time, position and magnetic information. Subsequent processing converts the coordinate system from geocentric to geodetic and removes a reference field. A.R.H.

N82-22596*# Sao Paulo Univ. (Brazil).
STRUCTURE, COMPOSITION AND THERMAL STATE OF THE CRUST IN BRAZIL Progress Report, Jun. - Sep. 1981
Igor Ivory Gil Pacca, Principal Investigator and Wladimir Shukowsky Sep. 1981 27 p refs Sponsored by NASA ERTS
(E82-10134; NASA-CR-168517; NAS 1.26:168517) Avail: NTIS HC A03/MF A01 CSCL 08G

Aeromagnetic survey data of the Minas Gerais areas were analyzed and compared with MAGSAT anomaly data. Initially the data set was used to determine the thickness of the magnetized crust. The value obtained is in agreement with crustal models derived from deep seismic sounding and gravity data, indicating that the bottom of the magnetized layer occurs close to the Moho transition. An analysis of the long wavelength pattern indicates that the anomalies form a series of lineations along the magnetic E-W. These are shown to be the result of attenuation. On the MAGSAT total intensity map localized anomalies are superimposed onto an anomaly background formed by alternating positive and negative patches. Implementation and testing of analysis software for MAGSAT data are also discussed. M.G.

N82-22597*# Pennsylvania State Univ., University Park. Dept. of Meteorology.
INTERACTIVE INITIALIZATION OF HEAT FLUX PARAMETERS FOR NUMERICAL MODELS USING SATELLITE TEMPERATURE MEASUREMENTS Quarterly Report, 1 Sep. - 1 Nov. 1981
Toby N. Carlson, Principal Investigator 30 Nov. 1981 12 p Sponsored by NASA HCMM
(E82-10149; NASA-CR-168534; NAS 1.26:168534; QR-3) Avail: NTIS CSCL 04A

Progress made during the past three months is summarized. Tentative confirmation that large accumulated rainfall variations significantly influence the distribution of surface heating over vegetated terrain was obtained. The interactive system was completed on the minicomputer, and graphics capability using a flatbed plotter was added. Two case studies were analyzed to determine regional surface heat flux and evaporation patterns over southern Indiana and eastern Kansas. The model on the IBM-370 was modified to include a time dependent component for daytime winds and vertical mixing of atmospheric pollutants. J.D.

N82-22598*# Phoenix Corp., McLean, Va.
IMPROVED DEFINITION OF CRUSTAL ANOMALIES FOR MAGSAT DATA
25 Jun. 1981 10 p ERTS
(Contract NAS5-25882)
(E82-10163; NASA-CR-168546; NAS 1.26:168546; QR-7) Avail: NTIS HC A02/MF A01 CSCL 08G

The components of the magnetic field were examined and expressions for the components were obtained. The radial and tangential components produce values for the magnetic potential on a circular boundary. A solution for the coefficient of the external an internal terms in the potential is presented. The solution was obtained using two different least squares methods: a recursive least squares procedure and the standard method. T.M.

N82-22599*# National Aeronautics and Space Administration, Washington, D. C.
THE LANDSAT STORY: MODULE U-2
Jan. 1980 35 p ERTS
(E82-10164; NASA-TM-84151; NAS 1.15:84151) Avail: NTIS HC A03/MF A01 CSCL 22B

A review of the various LANDSAT program elements which are relevant to user participation is provided. Sources for additional information and assistance where potential users may acquire more details and further guidance in using LANDSAT data are identified. The multispectral imagery capability of the LANDSAT satellites is emphasized. T.M.

N82-22600*# Remote Sensing Inst., Brookings, S. Dak. Remote Sensing Inst.
EVALUATION OF HCMM DATA FOR ASSESSING SOIL MOISTURE AND WATER TABLE DEPTH Final Report, Jun. 1977 - Mar. 1981
D. G. Moore, J. L. Heilman, J. A. Tunheim, F. C. Westin, W. E. Heilman, G. A. Beutler, and S. D. Ness, Principal Investigators Aug. 1981 205 p refs Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20771. Domestic users send orders to 'Attn: National Space Science Data Center'; non-domestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM
(Contract NAS5-24206)
(E82-10165; NASA-CR-168588; NAS 1.26:168588; SDSU-RSI-81-04) Avail: NTIS HC A10/MF A01 CSCL 08M

Data were analyzed for variations in eastern South Dakota. Soil moisture in the 0-4 cm layer could be estimated with 1-mm soil temperatures throughout the growing season of a rainfed barley crop (% cover ranging from 30% to 90%) with an r squared = 0.81. Empirical equations were developed to reduce the effect of canopy cover when radiometrically estimating the 1-mm soil temperature, r squared = 0.88. The corrective equations were applied to an aircraft simulation of HCMM data for a diversity of crop types and land cover conditions to estimate the 0-4 cm soil moisture. The average difference between observed and measured soil moisture was 1.6% of field capacity. HCMM data were used to estimate the soil moisture for four dates with an r squared = 0.55 after correction for crop conditions. Location of shallow alluvial aquifers could be accomplished with HCMM predawn data. After correction of HCMM day data for vegetation differences, equations were developed for predicting water table depths within the aquifer (r = 0.8). T.M.

N82-22601*# Pennsylvania State Univ., University Park. Dept. of Meteorology.
HEAT FLUX ESTIMATES OVER VEGETATION DERIVED USING RADIOMETRIC SURFACE TEMPERATURES AND A BOUNDARY LAYER MODEL IN COMPARISON WITH SODAR-DERIVED VALUES M.S. Thesis
James N. Cooper, Principal Investigator Aug. 1981 111 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E82-10166; NASA-CR-168589) Avail: NTIS HC A06/MF A01 CSCL 04A

An attempt was made to validate a method that uses radiometric surface temperatures and a boundary layer model to estimate surface energy budgets and characteristics. Surface temperatures from a hand-held radiometer and sodar data were collected simultaneously on seven days between mid-July and mid-October 1980. The comparison of the RDMS and sodar heat fluxes proved disappointing. Free convection conditions, required to produce sodar-derived heat fluxes, were inhibited by a terrain-induced low level inversion. Only three out of seven cases produced meaningful sodar heat fluxes. Of those three cases, one had good agreement and the other two had sodar heat fluxes 15 to 45 w/sq m lower than the RDMS values. Since the RDMS method is relatively untested, it was impossible to conclusively determine its validity from the results. There was evidence that the true heat flux was not underestimated by the RDMS, so it could be concluded that the Bowen ratios over well-watered vegetation were likely to be quite small. A.R.H.

N82-22602*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
COMPARISON OF WHEAT CLASSIFICATION ACCURACY USING DIFFERENT CLASSIFIERS OF THE IMAGE-100 SYSTEM
Nelson deJesusParada, Principal Investigator, Sherry Chou Chen, Mauricio Alves Moreira, and Angela Maria deLima Jun. 1981 17 p refs Sponsored by NASA Original contains color imagery.

Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS
(E82-10167; NASA-CR-168590; NAS 1.26:168590;
INPE-2125-RPE/349) Avail: NTIS HC A02/MF A01 CSCL 02C

Classification results using single-cell and multi-cell signature acquisition options, a point-by-point Gaussian maximum-likelihood classifier, and K-means clustering of the Image-100 system are presented. Conclusions reached are that: a better indication of correct classification can be provided by using a test area which contains various cover types of the study area; classification accuracy should be evaluated considering both the percentages of correct classification and error of commission; supervised classification approaches are better than K-means clustering; Gaussian distribution maximum likelihood classifier is better than Single-cell and Multi-cell Signature Acquisition Options of the Image-100 system; and in order to obtain a high classification accuracy in a large and heterogeneous crop area, using Gaussian maximum-likelihood classifier, homogeneous spectral subclasses of the study crop should be created to derive training statistics. T.M.

N82-22603*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
BRAZILIAN SATELLITE REMOTE SENSING PROGRAM SELECTED RECENT APPLICATIONS
Nelson deJesusParada, Principal Investigtor, Rene A. Novaes, Paulo R. Menezes, Waldir Paradella, Juercio T. Mattos, Sidnea Maluf, Magda A. Lombardo, Madalena Niero, Evlyn Marcia Leao deMoraes Novo, Celina Foresti et al Apr. 1981 56 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS
(E82-10168; NASA-CR-168591; NAS 1.26:168591;
INPE-2036-RPE/293) Avail: NTIS HC A04/MF A01 CSCL 05B

Applications in the areas of agronomy, geology, oceanography, geography, environment and cartography are presented. A brief description of the Brazilian program is also given. T.M.

N82-22604*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
INFLUENCE OF THE CARRYING VEHICLE IN THE AEROSPATIAL SURVEY OF NATURAL RADIOACTIVITY [INFLUENCIA DO VEICULO PORTADOR NO LEVANTAMENTO AEROSPACIAL DA RADIATIVIDADE NATURAL]
Nelson deJesusParada, Principal Investigator and Inacio Malmonge Martin Sep. 1981 19 p refs In PORTUGUESE Submitted for publication Sponsored by NASA ERTS
(E82-10169; NASA-CR-168592; NAS 1.26:168592;
INPE-2203-PRE/019) Avail: NTIS HC A02/MF A01 CSCL 08G

The importance of the choice of the carrying vehicle in aerial surveys of natural radioactivity, particularly in the location of uraniferous regions, is discussed. The results of observations depend on the exposure time, that is, the velocity and altitude the carrying vehicle can attain. Overflights of the same region using identical instrumentation but in two different types of aircraft were performed. A detailed statistical analysis of the measurements obtained during these flights demonstrates the precision of localization achievable by this method. Author

N82-22605*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
LAND USE SURVEYS BY MEANS OF AUTOMATIC INTERPRETATION OF LANDSAT SYSTEM DATA [LEVANTAMENTO DE USO DA TERRA ATRAVES E TECHNICAS DE INTERPRETACAO AUTOMATICA DE DADOS DO SISTEMA LANDSAT]
Nelson deJesusParada, Principal Investigator, Magda Adelaide Lombardo, Evlyn Marcia Leao deMoraes Novo, Madalena Niero, and Celina Foresti Aug. 1981 22 p refs In PORTUGUESE; ENGLISH summary Submitted for publication Sponsored by NASA ERTS
(E82-10170; NASA-CR-168593; NAS 1.26:168593;
INPE-2198-PRE/007) Avail: NTIS HC A02/MF A01 CSCL 08B

Analyses for seven land-use classes are presented. The classes are: urban area, industrial area, bare soil, cultivated area, pastureland, reforestation, and natural vegetation. The automatic classification of LANDSAT MSS data using a maximum likelihood algorithm shows a 39% average error of emission and a 3.45 error of commission for the seven classes. T.M.

N82-22606*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
USE OF AN AUTOMATIC PROCEDURE FOR DETERMINATION OF CLASSES OF LAND USE IN THE TESTE ARARAS AREA OF THE PERIPHERAL PAULIST DEPRESSION [UTILIZACAO DE PROCEDIMENTO AUTOMATICO PARA A DETERMI NACAO DE CLASSES DE USO DA TERRA NA DEPESSAO PERIFERICA PAULISTA, AREA TESTE ARARAS]
Nelson deJesusParada, Principal Investigator, Magda Adelaide Lombardo, and Dalton deMorisson Valeriano Jul. 1981 10 p refs In PORTUGUESE; ENGLISH summary Presented at 33d Ann. Meeting of SBPC, Salvador, Brazil, 8-15 Jul. 1981 Sponsored by NASA ERTS
(E82-10171; NASA-CR-168594; NAS 1.26:168594;
INPE-2155-RPE/374) Avail: NTIS HC A02/MF A01 CSCL 08B

An evaluation of the multispectral image analyzer (system Image 1-100), using automatic classification, is presented. The region studied is situated. The automatic was carried out using the maximum likelihood (MAXVER) classification system. The following classes were established: urban area, bare soil, sugar cane, citrus culture (oranges), pastures, and reforestation. The classification matrix of the test sites indicate that the percentage of correct classification varied between 63% and 100%. T.M.

N82-22607*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PHOTOGEOLOGIC MAPPING IN CENTRAL SOUTHWEST BAHIA, USING LANDSAT-1 MULTISPECTRAL IMAGES [MAPEMENTO FOTOGEOLOGICO NA REGIAO CENTRO-SUDOESTE DA BAHIA, UTILIZANDO IMAGENS MULTIESPECTRAIS DO SATELITE LANDSAT-1]
Nelson deJesusParada, Principal Investigator and Tomoyuki Ohara Jun. 1981 57 p refs In PORTUGUESE; ENGLISH summary Presented at 33d Ann. Meeting of SBPC, Salvador, Brazil, 8-15 Jul. 1981 Sponsored by NASA ERTS
(E82-10172; NASA-CR-168595; NAS 1.26:168595;
INPE-2124-RPE/348) Avail: NTIS HC A04/MF A01

The interpretation of LANDSAT multispectral imagery for geologic mapping of central southwest Bahia, Brazil is described. Surface features such as drainage, topography, vegetation and land use are identified. The area is composed of low grade Precambrian rocks covered by Mezozoic and Cenozoic sediments. The principal mineral prospects of economic value are fluorite and calcareous rocks. Gold, calcite, rock crystal, copper, potassium nitrate and alumina were also identified. J.D.

N82-22608*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
REMOTE SENSING: PHYSICAL PRINCIPLES, SENSORS AND PRODUCTS, AND THE LANDSAT [SENSORIAMENTO REMOTO: PRINCIPIOS FISICOS, SENSORES E PRODUTOS, E SISTEMA LANDSAT]
Nelson deJesusParada, Principal Investigator, Carlos Alberto Steffen, Joao Antonio Lorenzzetti, Jose Luiz Stech, and Ricardo Cartaxo Modesto deSouza Sep. 1981 79 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS
(E82-10173; NASA-CR-168596; NAS 1.26:168596;
INPE-2226-MD/013) Avail: NTIS HC A05/MF A01 CSCL 14E

Techniques of data acquisition by remote sensing are introduced in this teaching aid. The properties of the elements involved (radiant energy, topograph, atmospheric attenuation, surfaces, and sensors) are covered. Radiometers, photography, scanners, and radar are described as well as their products. Aspects of the LANDSAT system examined include the characteristics of the satellite and its orbit, the multispectral band scanner, and the return beam vidicon. Pixels (picture elements), pattern registration, and the characteristics, reception, and processing of LANDSAT imagery are also considered. A.R.H.

N82-22609*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

METHODOLOGY OF THE INTERPRETATION OF REMOTE SENSING DATA AND APPLICATIONS IN GEOLOGY [METODOLOGIA DE INTERPRETACAO DE DADOS DE SENSORIAMENTO REMOTO E APLICACOES EM GEOLOGIA]

Nelson deJesusParada, Principal Investigator, Paulo Veneziani, and Celio Eustaquio dosAnjos Sep. 1981 75 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS

(E82-10174; NASA-CR-168597; NAS 1.26:168597; INPE-2227-MD/014) Avail: NTIS HC A04/MF A01 CSCL 08G

Methods used for interpreting orbital (LANDSAT) data for regional geological mapping in Brazil are examined. Particular attention is given to the levels of analysis used for studying geomorphology, structural geology, lithology, stratigraphy, surface geology, and dynamic processes. Examples of regional mapping described include: (1) rock intrusions in SE Sao Paulo, the southern parts of Minas Gerais, and the states of Rio de Janeiro, and Espiritu Santo; (2) a preliminary survey of Pre-Cambrian geology in the State of Piaui; and (3) the Gondwana Project - surveying Jaguaribe plants. Mineral exploration in Rio Grande do Sul, and the geology of the Alcalino complex of Itatiaia are discussed as well as the use of automatic classifications of rock intrusions and of ilmenite deposits in the Floresta Region. Aerial photography, side looking radar, and thermal infrared scanning are other types of remote sensors also used in prospecting for geothermal anomalies in the city of Caldas Novas-Goias. A.R.H.

N82-22610*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

REMOTE SENSING APPLIED TO AGRICULTURE: BASIC PRINCIPLES, METHODOLOGY, AND APPLICATIONS [SENSORIAMENTO REMOTO APLICADO A AGRICULTURA: PRINCIPIOS BASICOS, METODOLOGIA EAPLICACOES]

Nelson deJesusParada, Principal Investigator and Francisco Jose Mendonca Sep. 1981 87 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS

(E82-10175; NASA-CR-168598; NAS 1.26:168598; INPE-2225-MD/012) Avail: NTIS HC A05/MF A01 CSCL 02C

The general principles of remote sensing techniques as applied to agriculture and the methods of data analysis are described. the theoretical spectral responses of crops; reflectance, transmittance, and absorbtance of plants; interactions of plants and soils with reflectance energy; leaf morphology; and factors which affect the reflectance of vegetation cover are dicussed. The methodologies of visual and computer-aided analyses of LANDSAT data are presented. Finally, a case study wherein infrared film was used to detect crop anomalies and other data applications are described. M.G.

N82-22611*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

WHEAT CULTIVATION: IDENTIFYING AND ESTIMATING AREA BY MEANS OF LANDSAT DATA [CULTURA DO TRIGO IDENTIFICACAO E AVALIACAO DE AREAS ATRAVES DE DADOS DO LANDSAT]

Nelson deJesusParada, Principal Investigator, Francisco Jose Mendonca, Dall Arthur Cottrell, Antonio Tebaldi Tardin, David Chung Liang Lee, Yosio Edemir Shimabukuro, Mauricio Alves Moreira, Angela Maria deLima, and Fernando Celso-Soares Maia Aug. 1981 30 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS

(E82-10176; NASA-CR-168599; NAS 1.26:168599; INPE-2204-RPE/397) Avail: NTIS HC A03/MF A01 CSCL 05B

Automatic classification of LANDSAT data supported by aerial photography for identification and estimation of wheat growing areas was evaluated. Data covering three regions in the State of Rio Grande do Sul, Brazil were analyzed. The average correct classification of IMAGE-100 data was 51.02% and 63.30%, respectively, for the periods of July and of September/October, 1979. J.D.

N82-22612*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

ESTIMATING REFORESTATION BY MEANS OF REMOTE SENSING [AVALIACAO DE REFLORESTAMENTO ATRAVES DE SENSO RIAMENTO REMOTE]

Nelson deJesusParada, Principal Investigator, Pedro Hernandez Filho, Yosio Edemir Shimabukuro, and Joao Roberto dosSantos Aug. 1981 62 p refs In PORTUGUESE; ENGLISH summary Presented at 33rd Ann. Meeting of the SBPC, 8-15 Jul. 1981, Salvador-Bahia, Brazil Sponsored by NASA ERTS

(E82-10177; NASA-CR-168600; NAS 1.26:168600; INPE-2201-PRE/010) Avail: NTIS HC A04/MF A01 CSCL 05B

LANDSAT imagery at the scale of 1:250.000 and obtained from bands 5 and 7 as well as computer compatible tapes were used to evaluate the effectiveness of remotely sensed orbital data in inventorying forests in a 462,100 area of Brazil emcompassing the cities of Ribeirao, Altinopolis Cravinhos, Serra Azul, Luis Antonio, Sao Simao, Santa Rita do Passa Quatro, and Santa Rosa do Viterbo. Visual interpretation of LANDSAT imagery shows that 37.766 hectares (1977) and 38,003.75 hectares (1979) were reforested areas of pine and eucalyptus species. An increment of 237.5 hectares was found during this two-year time lapse. A.R.H.

N82-22613*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

APPLICATION OF REMOTE SENSING TO THE PHOTOGEOLOGIC MAPPING OF THE REGION OF THE ITATIAIA ALKALINE COMPLEX M.S. Thesis [APLICACAO DE SENSORIAMENTO REMOTO NO MAPEAMENTO FOTOGEOLOGICO DA REGIAO DO COMPEXO ALCALINO DE ITATIAIA]

Nelson deJesusParada, Principal Investigator and Jose Eduardo Rodrigues Sep. 1981 124 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA

(E82-10178; NASA-CR-168601; NAS 1.26:168601; INPE-2220-TDL/062) Avail: NTIS HC A06/MF A01 CSCL 14E

Remote sensing methods applied to geologically complex areas, through interaction of ground truth and information obtained from multispectral LANDSAT images and radar mosaics were evaluated. The test area covers parts of Minos Gerais, Rio De Janeiro and Sao Paulo states and contains the alkaline complex of Itatiaia and surrounding Precambrian terrains. Geological and structural mapping was satisfactory; however, lithological varieties which form the massif's could not be identified. Photogeological lineaments were mapped, some of which represent the boundaries of stratigraphic units. Automatic processing was used to classify sedimentary areas, which includes the talus deposits of the alkaline massifs. E.A.K.

N82-22614*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

UTILIZATION OF LANDSAT IMAGES IN CARTOGRAPHY [UTILIZACAO DE IMAGENS LANDSAT NA CARTOGRAFIA]

Nelson deJesusParada, Principal Investigator and Paulo Cesar Gurgel Alburquerque Sep. 1981 39 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS

(E82-10179; NASA-CR-168602; NAS 1.26:168602; INPE-2219-MD/011) Avail: NTIS HC A03/MF A01 CSCL 08B

The use of multispectral imagery obtained from LANDSAT for mapping purposes is discussed with emphasis on geometric rectification, image resolution, and systematic topographic mapping. A method is given for constructing 1:250,000 scale maps. The limitations for satellite cartography are examined. E.A.K.

N82-22615*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

MONITORING OF HEAVY FLOODING BY ORBITAL REMOTE SENSING: THE EXAMPLE OF THE DOCE RIVER VALLEY [MONITORAMENTO DE ENCHENTES ATRAVES DE

SENSORIAMENTO REMOTO ORBITAL: EXEMPLO DO VALE DO RIO DOCE]

Nelson deJesusParada, Principal Investigator, Evlyn Marcia Leao deMoraes Novo, and Armando Pacheco dosSantos Jun. 1981 43 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS

(E82-10180; NASA-CR-168603; NAS 1.26:168603) Avail: NTIS HC A03/MF A01 CSCL 08H

The application of temporal LANDSAT data to study floods was verified, and the natural features responsible for this phenomenon were surveyed using the Doce river valley as a test site, because of the catastrophic (1978-1979) flood. Data from LANDSAT images and CCT's were used. Geomorphical mapping evaluated morphostructural features. Seven and nine classes of water surfaces for dry and rainy seasons were analyzed. The magnitude of the changes from preflood to postflood stage are estimated. The single Pixel program was applied to correlate the drainage basin characteristics to the grey level of LANDSAT data. E.A.K.

N82-22616*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

APPLICATION OF REMOTE SENSING TO THE STUDY OF THE DISPERSION OF POLLUTANTS IN THE ATMOSPHERE M.S. Thesis [APLICACAO DE SENSORIAMENTO REMOTO NO ESTUDO DA DISPERSAO DE POLUENTES NA ATMOSFERA]

Nelson deJesusParada, Principal Investigator and Jose Aparecido Torsani Aug. 1981 140 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS

(E82-10182; NASA-CR-168605; NAS 1.26:168605; INPE-2192-TDL/059) Avail: NTIS HC A07/MF A01 CSCL 13B

The atmospheric dispersion of smoke plumes from the Compania Nacional de Alcalis, Cabo Frio, Brazil, as shown in eleven LANDSAT images was investigated. Determination of lateral standard deviation by the Hoegstroem method provided the most accurate value in neutral conditions, and the Pasquill-Gifford and Juelich methods provided better values over ocean areas. The combination of multispectral scanner bands was determined to provide the best overall contrast between the smoke and the underlying water surface. The effect of the synoptic situation and resurgences on plumes demonstrate that dispersion is governed primarily by the difference between water and air temperatures, with higher water temperatures inducing vigorous dispersion. J.D.

N82-22617*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

STUDY OF THE RELATION BETWEEN SOIL USE, VEGETATION COVERAGE, AND THE DISCHARGE OF SEDIMENTS FROM ARTIFICIAL RESERVOIRS USING MSS/LANDSAT IMAGES. EXAMPLE: THE TRES MARIAS RESERVOIR AND ITS SUPPLY BASIN [ESTUDO DA RELACAO ENTRE USO DO SOLO, COBERTURA VEGETAL E DESCARGA DE SEDIMENTOS DE RESERVATORIOS ARTIFICIAIS, ATRAVES E IMAGENS MSS/LANDSAT. EXEMPLO: RESERVATORIO DE TRES MARIAS E SUA BACIA ABASTECEDORA (MG)]

Nelson deJesusParada, Principal Investigator and Tania Maria Sausen Aug. 1981 41 p refs In PORTUGUESE; ENGLISH summary Presented at the 9th Brazilian Congr. on Agr. Eng., Brasilia, Brazil, 22-25 Jun. 1981 Submitted for publication Sponsored by NASA ERTS

(E82-10183; NASA-CR-168606; NAS 1.26:168606; INPE-2195-PRE/004) Avail: NTIS HC A03/MF A01 CSCL 08B

The land use and types of vegetation in the region of the upper Sao Francisco River, Brazil, are identified. This region comprises the supply basin of the Tres Marias reservoir. Imagery from channels 5 and 7 of the LANDSAT multispectral band scanner during wet and rainy seasons and ground truth data were employed to characterize and map the vegetation, land use, and sedimentary discharges from the reservoir. Agricultural and reforested lands, meadows, and forests are identified. Changes in land use due to human activity are demonstrated. J.D.

N82-22618*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

ESTIMATING THE QUALITY OF PASTURAGE IN THE MUNICIPALITY OF PARAGOMINAS (PA) BY MEANS OF AUTOMATIC ANALYSIS OF LANDSAT DATA [AVALIACAO DA QUALIDADE DAS PASTAGENS NO MUNICIPIO DE PARAGOMINAS (PA), ATRAVES DA ANALISE AUTOMATICA DE DADOS DO LANDSAT]

Nelson deJesusParada, Principal Investigtor, Armando Pacheco dosSantos, Evlyn Marcia Leao deMoraes Novo, and Valdete Duarte Aug. 1981 29 p refs In PORTUGUESE; ENGLISH summary Presented at the 9th Brazilian Congr. on Agr. Eng., Brasilia, Brazil, 22-25 Jun. 1981 Submitted for publication Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS

(E82-10184; NASA-CR-168607; NAS 1.26:168607; INPE-2200-PRE/009) Avail: NTIS HC A03/MF A01 CSCL 02F

The use of LANDSAT data to evaluate pasture quality in the Amazon region is demonstrated. Pasture degradation in deforested areas of a traditional tropical forest cattle-raising region was estimated. Automatic analysis using interactive multispectral analysis (IMAGE-100) shows that 24% of the deforested areas were occupied by natural vegetation regrowth, 24% by exposed soil, 15% by degraded pastures, and 46% was suitable grazing land. J.D.

N82-22619*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

PROCESSING MULTISPECTRAL DATA OBTAINED BY ORBITAL PLATFORMS OF THE LANDSAT SERIES FOR STUDIES OF WATER QUALITY IN GUANABARA BAY M.S. Thesis [PROCESSAMENTO DE DADOS MULTIESPECTRAIS, OBTIDOS POR PLATAFORMAS ORBITAIS DA SERIE LANDSAT, PARA ESTUDOS DA QUALIDADE DA AGUA NABAIA DE GUANABARA]

Nelson deJesusParada, Principal Investigator and Juan Jose Verdesio Jul. 1981 201 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 51198 ERTS

(E82-10185; NASA-CR-168608; NAS 1.26:168608; INPE-2181-TDL/058) Avail: NTIS HC A10/MF A01 CSCL 05B

The relationship existing between Guanabara Bay water quality ground truth parameters and LANDSAT MSS video data was investigated. The parameters considered were: chorophyll content, water transparency usng the Secchi disk, salinity, and dissolved ammonia. Data from two overflights was used, and methods of processing digital data were compared. Linear and nonlinear regression analyses were utilized, comparing original data with processed data by using the correlation coefficient and the estimation mean error. It was determined that better quality data are obtained by using radiometric correction programs with a physical basis, contrast ratio, and normalization. Incidental locations of floating vegetation, changes in bottom depth, oil slicks, and ships at anchor were made. J.D.

N82-22620*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

TEN-ECOSYSTEM STUDY Final Report

A. V. Mazade, Principal Investigator Aug. 1981 96 p refs Sponsored in part by USDA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E82-10186; NASA-CR-167457; NAS 1.26:167457; LEMSCO-13491) Avail: NTIS HC A05/MF A01 CSCL 13B

Remote sensing methodology developed for the Nationwide Forestry Applications Program utilize computer data processing procedures for performing inventories from satellite imagery. The Ten-Ecosystem Study (TES) was developed to test the processing procedures in an intermediate-sized application study. The results of TES indicate that LANDSAT multispectral imagery and

associated automatic data processing techniques can be used to distinguish softwood, hardwood, grassland, and water and make inventory of these classes with an accuracy of 70 percent or better. The technical problems encountered during the TES and the solutions and insights to these problems are discussed. The TES experience is useful in planning subsequent inventories utilizing remote sensing technology. T.M.

N82-22621*# Sao Paulo Univ. (Brazil).
STRUCTURE, COMPOSITION AND THERMAL STATE OF THE CRUST IN BRAZIL Progress Report, Feb. - May 1981
Igor Ivory Gil Pacca, Principal Investigator and Wladimir Shukowsky May 1981 41 p refs Sponsored by NASA ERTS
(E82-10187; NASA-CR-168615; NAS 1.26:168615) Avail: NTIS HC A03/MF A01 CSCL 08G

Efforts in support of a geomagnetic survey of the Brazilian area are described. Software to convert MAGSAT data tapes to the Burroughs/B-6700 binary format was developed and tested. A preliminary analysis of the first total intensity anomaly map was performed and methodologies for more intensive analysis were defined. The sources for correlative geological, aeromagnetic, and gravimetric data are described. M.G.

N82-22622*# Herzberg Inst. of Astrophysics, Ottawa (Ontario).
STUDIES OF HIGH LATITUDE CURRENT SYSTEMS USING MAGSAT VECTOR DATA Progress Report, 16 Nov. 1980 - 31 Aug. 1981
J. Ronald Burrows, Principal Investigator, T. J. Hughes, D. D. Wallis, and Margaret D. Wilson 31 Aug. 1981 19 p Sponsored by NASA ERTS
(E82-10188; NASA-CR-168616; NAS 1.26:168616; PR-3) Avail: NTIS HC A02/MF A01 CSCL 04A

The magnetic disturbance fields caused by global external current systems are considered with particular emphasis on improving the understanding of the physical processes which control high latitude current systems. Following processing the MAGSAT data were routinely plotted in the Universal Time (UT) format as well as in a polar plot format. The H'D'U' coordinate system, was adopted as the standard for representing the MAGSAT residual magnetic field vectors. A data file was generated and the TPOLAR computer code was developed to determine from the orbital elements, the time, latitude, and MLT of the extremum latitude of each transpolar segment of orbit. The precision of the vector data set from MAGSAT prompted an extended exploratory phase for data analysis procedures, modeling techniques and phenomenology. A.R.H.

N82-22623*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
SPECTRAL PROPERTIES OF AGRICULTURAL CROPS AND SOILS MEASURED FROM SPACE, AERIAL, FIELD, AND LABORATORY SENSORS
M. E. Bauer, Principal Investigator, V. C. Vanderbilt, B. F. Robinson, and C. S. T. Daughtry Nov. 1981 21 p refs Repr. from Proc. of the Intern. Arch. of Photogrammetry, v. 23(B7) p 56-73 Presented at the 14th Congr. of the Intern. Soc. for photogrammetry, Hamburg, 13-15 Jul. 1980 Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15466; Proj. AgRISTARS)
(E82-10189; NASA-CR-168617; SR-P1-04200; NAS 1.26:168617; LARS-07138) Avail: NTIS HC A02/MF A01 CSCL 20F

Investigations of the multispectral reflectance characteristics of crops and soils as measured from laboratory, field, aerial, and satellite sensor systems are reviewed. The relationships of important biological and physical characteristics to the spectral properties of crops and soils are addressed. J.D.

N82-22624*# Bureau de Recherches Geologiques et Minieres, Minieres, Paris (France).
SPATIAL THERMAL RADIOMETRY CONTRIBUTION TO THE MASSIF ARMORICAIN AND THE MASSIF CENTRAL FRANCE LITHO-STRUCTURAL STUDY Final Report
J. Y. Scanvic, Principal Investigator Nov. 1980 85 p refs Sponsored by NASA Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20771. Domestic users send orders to 'Attn: National Space Science Data Center'; nondomestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM
(E82-10190; NASA-CR-168618; NAS 1.26:168618; Rept-80-SGN-848-GEO-Rept-3) Avail: NTIS HC A05/MF A01 CSCL 08G

Thermal zones delimited on HCMM images, by visual interpretation only, were correlated with geological units and carbonated rocks, granitic, and volcanic rocks were individualized rock signature is evolutive parameter and some distinctions were made by addition of day, night and seasonal thermal image interpretation. This analysis also demonstrated that forest cover does not mask the underlying rocks thermal signature. Thermal linears are associated with known tectonics but the observed thermal variations from day to night and from one to another represent a promising concept to be studied in function of neotectonics and hydrogeology. The thermal anomalies discovered represent a potential interest which is to be evaluated. Significant results were obtained in the Mont Dore area and additional geological targets were defined in the Paris Basin and the Montmarault granite. Author

N82-22625*# Environmental Research and Technology, Inc., Concord, Mass.
THE APPLICATION OF HEAT CAPACITY MAPPING MISSION (HCMM) THERMAL DATA TO SNOW HYDROLOGY Final Report, Sep. 1977 - Mar. 1981
James C. Barnes, Principal Investigator, Clinton J. Bowley, Michael D. Smallwood, and James H. Willand Mar. 1981 112 p refs Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20771. Domestic users send orders to 'Attn: National Space Science Data Center'; non-domestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM
(Contract NAS5-24316)
(E82-10191; NASA-CR-168619; NAS 1.26:168619; ERT-P-2061-F) Avail: NTIS HC A06/MF A01 CSCL 08L

The application of HCMM thermal infrared data to snow hydrology and the prediction of snowmelt runoff was evaluated. Data for the Salt Verde watershed in central Arizona and the southern Sierra Nevada in California were analyzed and compared to LANDSAT and NOAA satellite data, U-2 thermal data, and other correlative data. It was determined that HCMM thermal imagery provides data as accurate for snow mapping as does visible imagery, and that in comparison with the reslution of other satellite imagery, it may be the most useful. Data from the HCMM thermal channel, with careful calibration, provides useful snow surface temperature data for hydrological purposes. An approach to an automated method of analysis is presented. J.D.

N82-22626*# Environmental Research Inst. of Michigan, Ann Arbor.
ANALYSIS OF SCANNER DATA FOR CROP INVENTORIES Progress Report, 15 Nov. 1980 - 14 Feb. 1981
Robert Horvath, Principal Investigator, Richard C. Cicone, Richard J. Kauth, William A. Malila, W. Pont, B. Thelen, and A. Sellman Apr. 1981 141 p ERTS
(Contract NAS9-15476)
(E82-10192; NASA-CR-161047; NAS 1.26:161047; ERIM-152400-4-P) Avail: NTIS HC A07/MF A01 CSCL 02C

Accomplishments for a machine-oriented small grains labeler T&E, and for Argentina ground data collection are reported. Features of the small grains labeler include temporal-spectral profiles, which characterize continuous patterns of crop spectral development, and crop calendar shift estimation, which adjusts for planting date differences of fields within a crop type. Corn and soybean classification technology development for area estimation for foreign commodity production forecasting is reported. Presentations supporting quarterly project management reviews and a quarterly technical interchange meeting are also included. T.M.

N82-22627*# North Carolina State Univ. at Raleigh. Dept. of Marine, Earth, and Atmospheric Sciences.

MAGSAT AND AEROMAGNETIC DATA IN THE NORTH AMERICAN CONTINENT Progress Report
8 Jun. 1981 2 p ERTS
(Contract NAS5-26157)
(E82-10193; NASA-CR-168620; NAS 1.26:168620) Avail: NTIS HC A02/MF A01 CSCL 05B

Problems were encountered in deriving a proper reference field to be subtracted from the aeromagnetic data obtained from Project MAGNET. Field models tried thus far do not seem to eliminate properly the main field. The MAGSAT data in the North American continent for the period November 1 to December 22, 1979 are being compiled and compared with MAGNET data. Efforts are being made to eliminate the orbital bias errors. A computer program was developed and successfully tested which computes a topographic profile of the Curie depth isotherm which fits best to the observed vector or scalar field magnetic data. A.R.H.

N82-22628*# Purdue Univ., Lafayette, Ind. Dept. of Geosciences.
STUDY OF GRAVITY AND MAGNETIC ANOMALIES USING MAGSAT DATA Quarterly Progress Report, Apr. - Jun. 1981
L. W. Braile, W. J. Hinze, and R. R. B. vonFrese, Principal Investigators 1 Jul. 1981 9 p ERTS
(E82-10194; NASA-CR-168621; NAS 1.26:168621) Avail: NTIS HC A02/MF A01 CSCL 08B

The results of modeling satellite-elevation magnetic and gravity data using the constraints imposed by near surface data and seismic evidence shows that the magnetic minimum can be accounted for by either an intracrustal lithologic variation or by an upwarp of the Curie point isotherm. The long wavelength anomalies of the NOO's-vector magnetic survey of the conterminous U.S. were contoured and processed by various frequency filters to enhance particular characteristics. A preliminary inversion of the data was completed and the anomaly field calculated at 450 km from the equivalent magnet sources to compare with the POGO satellite data. Considerable progress was made in studing the satellite magnetic data of South America and adjacent marine areas. Preliminary versions of the 1 deg free-air gravity anomaly map (20 m gal contour interval) and the high cut (lambda approximately 8 deg) filtered anomaly maps are included. A.R.H.

N82-22629*# Texas Univ. at Dallas, Richardson. Center for Space Sciences.
INVESTIGATION OF THE EFFECTS OF EXTERNAL CURRENT SYSTEMS ON THE MAGSAT DATA UTILIZING GRID CELL MODELING TECHNIQUES Quarterly Status Technical Progress Report, 1 Apr. - 30 Jun. 1981
David M. Klumpar, Principal Investigator 8 Jul. 1981 12 p ERTS
(Contract NAS5-26309)
(E82-10195; NASA-CR-168622; NAS 1.26:168622; UTD-E0533-01; QSTRP-5) Avail: NTIS HC A02/MF A01 CSCL 05B

Refinements to the modeling procedure developed to compute the magnetic fields at satellite orbit due to current distributions in the ionosphere and magnetosphere are described. The modeling technique utilizes a linear current element representation of the large scale space current system. A model polar current system is presented and magnetic field perturbations resulting from this system are computed along two hypothetical satellite orbits. M.G.

N82-22630# Committee on Science and Technology (U. S. House).
CIVIL LAND REMOTE SENSING SYSTEM
Washington GPO 1982 77 p Presented by the Subcom. on Space Sci. and Appl. of the Comm. on Sci. and Technol., 97th Congr., 1st Sess., Dec. 1981
(GPO-87-070) Avail: Subcommittee on Space Science and Applications

Current remote sensing research and development activities, current planning for an operational system, and international remote sensing activities are summarized. Significant issues considered include: the role of government vis-a-vis the private sector, the way in which it can best serve both the public and the private sector, its role in future research and development, and regulations and terms it must mandate for a civil land remote sensing system. Legislation needed for government/industry joint ventures is also examined. A.R.H.

N82-22631*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HEALTH AND SAFETY EVALUATION OF A MODIFIED TUNNEL BORER DESIGN FOR APPLICATION TO SINGLE ENTRY COAL MINE DEVELOPMENT
Wayne F. Zimmerman 15 Feb. 1982 125 p refs
(Contract NAS7-100; DE-AI01-76ET-12548)
(NASA-CR-168807; JPL-Pub-82-12; NAS 1.26:168807; DOE/ET-12548/11) Avail: NTIS HC A06/MF A01 CSCL 08I

A health and safety analysis of a single entry coal tunnel borer system is given. The results of the health analysis indicated that while the tunnel borer design offered improvements in dust control through the use of water sprays, a higher face ventilation rule, and the application of spalling rather than the conventional grinding process, it interjected an additional mutagen and toxic compound into the environment through the use of shotcrete. The tunnel borer system easily conformed with the prescribed fatality limit, but exceeded the required limits for disabling and overall injuries. It also exhibited projected disabling and overall injury rates considerably higher than existing continuous mining injury rates. Consequently, the tunnel borer system was not considered an advanced system. R.J.F.

N82-22632*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EVALUATION OF ADAM/1 MODEL FOR ADVANCED COAL EXTRACTION CONCEPTS
Govind K. Deshpande and Mukund D. Gangal 15 Jan. 1982 26 p refs
(Contract NAS7-100; DE-AI01-76ET-12548)
(NASA-CR-168812; JPL-Pub-82-21; NAS 1.26:168812; DOE/ET-12548/12) Avail: NTIS HC A03/MF A01 CSCL 08I

Several existing computer programs for estimating life cycle cost of mining systems were evaluated. A commercially available program, ADAM/1 was found to be satisfactory in relation to the needs of the advanced coal extraction project. Two test cases were run to confirm the ability of the program to handle nonconventional mining equipment and procedures. The results were satisfactory. The model, therefore, is recommended to the project team for evaluation of their conceptual designs. R.J.F.

N82-22633# Paraho Development Corp., Grand Junction, Colo.
PARAHO OIL SHALE MODULE. SITE DEVELOPMENT PLAN, TASK 4
Oct. 1981 157 p 2 Vol.
(Contract DE-FC03-80ET-14103)
(DE82-003765; DOE/ET-14103/T1) Avail: NTIS HC A08/MF A01

A management plan and schedule which covers all requirements for gaining access to the site and for conducting a Paraho Process demonstration program was prepared. The oil shale available should represent a regional resource of suitable size and quality for commercial development. Discussed in this report are: proof of ownership; requirements for rights-of-way for access to the site; local zoning restrictions; water rights; site availability verification; and other legal requirements. DOE

N82-22634# Paraho Development Corp., Grand Junction, Colo.
PARAHO OIL SHALE MODULE. CRITICAL ITEMS IDENTIFICATION, TASK 11
Oct. 1981 39 p 2 Vol.
(Contract DE-FC03-80ET-14103)
(DE82-003727; DOE/ET-14103/T2) Avail: NTIS HC A03/MF A01

A critical item in the demonstration plant is one that has a notable impact on plant performance. Generally, these items required that decisions be made throughout the course of the Phase I work to facilitate design work and preparation of estimates. The approach taken in each case represents the engineer's best judgement, based on both experience and timely evaluations. Certain critical items were identified as important enough to justify formal trade-off studies to document the alternatives

considered and to justify explicitly the selected design. The critical items addressed during the Phase I work are summarized. Both the critical items and the area of performance affected are covered. A brief description of each critical item is presented including: mine and process shale areas; above ground process areas; and environmental and resource areas. DOE

N82-22635# Rhode Island Univ., Kingston. Dept. of Geology.

PEAT-RESOURCE ESTIMATION FOR RHODE ISLAND Quarterly Report

Sep. 1981 5 p refs Prepared for the Governor's Energy Office, Providence, R.I.

(Contract DE-FG18-81FC-05108)

(DE82-000325; DOE/FC-05108/T1) Avail: NTIS HC A02/MF A01

The fuel potential of peat deposits occuring in freshwater wetlands of Rhode Island is determined. The peat deposits and the amount of fuel grade peat in areas of high priority are identified. Aerial observation and discussion with forestry and wildlife scientists at the University of Rhode Island indicate the larger peat deposits of Rhode Island occupy former glaciofluvial drainage ways and present river flood plains. Numerous smaller deposits, similar to those examined on Block Island, occur in ice block molds and kettleholes. A detailed study of peat deposits will take place during the resource inventory including: wetland mapping, depth contour and peat isopach maps, stratigraphic cross sections and fuel analysis of peat samples. DOE

N82-22636# Natural Environment Research Council, London (England).

OVERSEAS GEOLOGY AND MINERAL RESOURCES NUMBER 56: A GEOLOGICAL INTERPRETATION OF LANDSAT IMAGERY AND AIR PHOTOGRAPHY OF BOTSWANA

D. I. J. Mallick, F. Habgood, and A. C. Skinner 1981 41 p refs Original contains color maps Original contains color illustrations

(OGMR-56; ISBN-0-11-884138-6) Avail: NTIS HC A03/MF A01; HMSO £5

A 1:1 million geological map compiled from LANDSAT and air photography of Botswana and border areas is presented. The distribution of 22 geological units of Karoo and Precambrian age is shown together with the post-Karoo deposits, differentiated into 7 units, based on geomorphological criteria. The data help distinguish volcanics of the Kanye Group from those of the Ventersdorp Group, and the Transvaal Supergroup from those of the Waterberg Group at localities far from their better exposed outcrop areas in the southeast of the country. Eolian, lacustrine and alluvial components of Kalahari desert superficial deposits are differentiated. The fracture and lineament pattern is only partly evident from the photographs. Author (ESA)

N82-22637# Bergbau-Forschung G.m.b.H., Essen (West Germany).

TIMESAVING METHODS ADAPTABLE TO MINING WHICH UTILIZE STRUCTURAL INFORMATION ON THE FOREFIELD WHILE APPLYING NEW TECHNOLOGIES Final Report, Jun. 1980

Hans Murawski and Karl-Heinz Rueller Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 125 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-81-220; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 26,45

Fabric data for diagnosis of tectonics in a coal mine was studied. The possibility of combining geophysics, well logging, and structural surveys in forefield research was investigated in the Ruhr district. Subterranean outcroppings in mines were studied. Planes of cleavage, systems of cleats, and genesis of cleats were measured photometrically. A data reduction and display program, PLANICOMP, was improved, and electronic data processing was used to find Braun's index. A tectonic deformation index and basic structure are determined. The system provides sufficient information on the tectonic situation in the forefield and is a practicable aid to the miner. Author (ESA)

N82-22638# Ruhrgas A.G., Essen (West Germany).

TESTING THE SHEARER-LOADER EDW 170/200 LN FOR THIN SEAMS IN CONNECTION WITH CHAINLESS HAULAGE Final Report

Johann Tegenthoff and Karl-Heinz Klimek Bonn Bundesministerium fuer Forschung und Technologie Jan. 1982 28 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-82-017; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 5,50

Coal extraction by cutting was investigated. A low clearance machine design was tested. To decrease average seam thicknesses, a system able to operate in a seam aperture of approximately 1.7 m was needed. Maximum possible clearance above the machine was sought, while maintaining sufficient clearance underneath the machine for haulage. A machine height of 855 mm with underbody clearance of 475 mm was achieved. The drive performance and traction force of the winch require improvement. For better utilization of machine potential, a rotational angle should be adapted to the positioning of the drum cutters. Author (ESA)

N82-22639# New England River Basins Commission, Boston, Mass.

PENOBSCOT RIVER BASIN OVERVIEW

Sep. 1981 152 p refs Sponsored in part by Water Resources Council

(PB82-131467) Avail: NTIS HC A08/MF A01 CSCL 13B

Water resources issues identified in the Penobscot River basin are discussed and concern hydropower development, minerals development, forestry, and acid rain. Other water resource problems in the basin, principally related to the urban centers in the southern portion, include point source wastewater discharges, water supply needs, some flooding, and access to water-related recreation. GRA

N82-22640# New England River Basins Commission, Boston, Mass.

ST. CROIX/MAINE EASTERN COASTAL RIVER BASINS OVERVIEW: PUBLIC REVIEW DRAFT

Sep. 1981 161 p refs Sponsored in part by Water Resources Council

(PB82-133091) Avail: NTIS HC A08/MF A01 CSCL 13B

Issues identified in the St. Croix/Maine Eastern Coastal River basins center on proposals for major energy facilities in Cobscook Bay, forestry, acid rain, potential flooding and sometime conflicting uses of the rivers. International concerns are addressed. GRA

N82-22641# New England River Basins Commission, Boston, Mass.

PRESUMPSCOT RIVER BASIN/CASCO BAY OVERVIEW: PUBLIC REVIEW DRAFT

Sep. 1981 124 p refs Sponsored in part by Water Resources Council

(PB82-133349) Avail: NTIS HC A06/MF A01 CSCL 13B

Demand on water resources, problems associated with the use of resources, and programs and projects relevant to the management of water in each of the region's major river basins are discussed. The most significant issues identified in the Presumpscot River basin and Casco Bay drainage area are on port development and management in Portland Harbor, and ground water protection. GRA

N82-22642# New England River Basins Commission, Boston, Mass.

ST. JOHN RIVER BASIN OVERVIEW: PUBLIC REVIEW DRAFT

Sep. 1981 150 p refs Sponsored in part by Water Resources Council

(PB82-131251) Avail: NTIS HC A07/MF A01 CSCL 13B

The New England River Basin Commission has prepared summary reports on each of the region's major river basins. The most significant issues identified in the St. John River basin center on development and resource allocation in the Upper St. John and Aroostook River basins, the impact of agricultural activities on water quality, mineral development, harvesting

techniques and the use of chemicals in forest management, acid rain, and institutional arrangements between Canada and the U.S. GRA

N82-22643*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
USE OF NOAA/AVHRR VISIBLE AND NEAR-INFRARED DATA FOR LAND REMOTE SENSING
Stanley R. Schneider (NOAA)02(NOAA), David F. McGinnis, Jr., and James A. Gatlin Sep. 1981 55 p refs Sponsored in part by NOAA Prepared in cooperation with Earth Satellite Corp.
(NASA-TM-84186; NAS 1.15:84186; PB82-129388; NOAA-TR-NESS-84; NOAA-81100501) Avail: NTIS HC A04/MF A01 CSCL 08L

The data were analyzed for their usefulness in monitoring lake ice, snowcover, water quality, crop condition and terrain classification on the H.P. 1000 computer interactive system. Terrain phenomena that were studied using LANDSAT MSS data could also be monitored with the NOAA-6 channels, but at a lesser resolution. T.M.

N82-22644# National Oceanic and Atmospheric Administration, Rockville, Md. Ocean Technology and Engineering Services Office.
BIAS CORRECTION PROCEDURES FOR AIRBORNE LASER HYDROGRAPHY
Gary C. Guenther and Robert W. L. Thomas Aug. 1981 110 p refs Prepared in cooperation with EG and G Washington Analytical Services Center, Inc., Rockville, Md. sponsored in part by Naval Ocean Research and Development Activity, NSTL Station, Miss. (PB82-130089; NOAA-TR-OTES-03; NOAA-8110502) Avail: NTIS HC A06/MF A01 CSCL 08J

Depending on the entry nadir angle of the beam and the optical properties of the water, one of two opposing effects, multiple scattering and geometric 'undercutting', will dominate and result in either a deep or shallow depth measurement bias, respectively. The magnitude of this bias can greatly exceed international hydrographic accuracy standards, and hence bias correctors must be calculated and applied to the raw depths in postflight data processing to attain the required accuracy for the overall system. The magnitudes of the bias correctors depend not only on the water and flight parameters, but also on the basic design of the receiver electronics. Several typical systems and procedures required to calculate a set of bias correctors for any given system are described and a cookbook approach for the necessary postflight data processing algorithms are included. GRA

N82-22645# Transportation Research Board, Washington, D.C.
FROST ACTION AND RISK ASSESSMENT IN SOIL MECHANICS
G. L. Guymon, R. L. Berg, T. C. Johnson, T. V. Hromadka, K. J. Lomas, R. H. Jones, Bernard D. Alkire, David M. Cole, Lynne H. Irwin, Thaddeus C. Johnson et al 1981 95 p refs
(PB82-131350; TRB/TRR-809; ISBN-0-309-03250-4; ISSN-0361-1981; LC-81-18755) Avail: NTIS HC A05/MF A01; HC also avail. from Transportation Research Board, 2101 Constitution Ave., NW, Washington, DC 20418 CSCL 08M

The fundamental behavior and frost susceptibility of various soils are considered. Results from a mathematical model of frost heave were examined. The effect of variable-drainage freeze-thaw tests on post-thaw shear strength, and the effect of freezing and thawing on resilient modulus of a granular soil exhibiting nonlinear behavior, are discussed. Frost-susceptibility ratings and pavement structure performance are reported. T.M.

N82-22646# Northeastern Forest Experiment Station, Broomall, Pa.
FOREST STATISTICS FOR OHIO, 1979 Final Forest Service Resource Bulletin
Donald F. Dennis and Thomas W. Birch 1981 82 p refs Sponsored by Dept. of Agriculture
(PB82-126012; NEFES/82-32; FSRB-NE-68) Avail: NTIS HC A05/MF A01 CSCL 02F

This is a statistical report on the third forest survey of Ohio conducted in 1978 and 1979. Statistical findings are based on data from remeasured and new 10-point variable radius plots. The current status of forest-land area, timber volume, and annual growth and removals is presented. GRA

N82-23116*# Evangel Coll., Springfield, Mo.
USE OF LANDSAT DATA TO DEFINE SOIL BOUNDARIES IN CARROLL COUNTY, MISSOURI
Steve E. Davidson *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 12 p refs (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 08M

N82-23119*# Texas A&M Univ., College Station. Dept. of Meteorology.
TEMPORAL CHANGES OF THE GLOBAL REFLECTANCE OF A WHEAT FIELD AS A FUNCTION OF DAILY SOLAR IRRADIANCE
Guy A. Franceschini *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 21 p (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 02C

N82-23133*# Mississippi State Univ., State College.
A COMPARISON OF STRATIFIED VERSUS REGRESSION ESTIMATORS Final Report
Helen Calvert Takacs *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 17 p refs (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 05B

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N82-22647# Comptroller General of the United States, Washington, D.C.
GREATER ENERGY EFFICIENCY CAN BE ACHIEVED THROUGH LAND USE MANAGEMENT Report to the Congress
21 Dec. 1981 58 p refs
(EMD-82-1; B-198982) Avail: SOD

An analysis of energy conservation methods based on land use management is given and recommendations are made. When planning new growth and redevelopment, communities can significantly reduce energy consumption by incorporating energy efficient land use concepts such as site and building design, locational planning, and higher density development. Decisionmakers, however, are reluctant to use these concepts because of major barriers such as the cost of implementing the concepts and resistance to higher density development. The Federal Government can play a role in promoting energy-efficient land use by providing guidance through its policies, supporting research and comprehensive planning, and providing needed financial incentives. R.J.F.

N82-22648 International Institute for Applied Systems Analysis, Laxenburg (Austria).
THE POSSIBLE SHARE OF SOFT/DECENTRALIZED RENEWABLES IN MEETING THE FUTURE ENERGY DEMANDS OF DEVELOPING REGIONS
A. M. Khan Sep. 1981 41 p refs
(RR-81-18; ISBN-3-7045-0015-1) Copyright. Avail: Issuing Activity

The contribution of soft/decentralized renewables to energy supply in market economy developing regions is discussed. Investment requirements and fuel production costs are compared with conventional supply schemes. Difficulties associated

with these technologies are analyzed. The most promising soft/decentralized renewables are: windmills and small hydropower units for use in irrigation and for supplying electricity to rural households and small towns; charcoal for meeting thermal energy requirements of industry, households, and the service sector; biogas for use in rural households; and solar heat for supplying hot water/steam to industry, households, and services. Author (ESA)

N82-22649*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT OF ROTOR CONFIGURATION ON GUYED TOWER AND FOUNDATION DESIGNS AND ESTIMATED COSTS FOR INTERMEDIATE SITE HORIZONTAL AXIS WIND TURBINES

G. R. Frederick (Toledo Univ.), J. R. Winemiller, and J. M. Savino Mar. 1982 39 p refs

(NASA-TM-82804; DOE/NASA/20320-39; NAS 1.15:82804) Avail: NTIS HC A03/MF A01 CSCL 10B

Three designs of a guyed cylindrical tower and its foundation for an intermediate size horizontal axis wind turbine generator are discussed. The primary difference in the three designs is the configuration of the rotor. Two configurations are two-blade rotors with teetering hubs - one with full span pitchable blades, the other with fixed pitch blades. The third configuration is a three-bladed rotor with a rigid hub and fixed pitch blades. In all configurations the diameter of the rotor is 38 meters and the axis of rotation is 30.4 meters above grade, and the power output is 200 kW and 400 kW. For each configuration the design is based upon for the most severe loading condition either operating wind or hurricane conditions. The diameter of the tower is selected to be 1.5 meters (since it was determined that this would provide sufficient space for access ladders within the tower) with guy rods attached at 10.7 meters above grade. Completing a design requires selecting the required thicknesses of the various cylindrical segments, the number and diameter of the guy rods, the number and size of soil anchors, and the size of the central foundation. The lower natural frequencies of vibration are determined for each design to ensure that operation near resonance does not occur. Finally, a cost estimate is prepared for each design. A preliminary design and cost estimate of a cantilever tower (cylindrical and not guyed) and its foundation is also presented for each of the three configurations. Author

N82-22650*# National Aeronautics and Space Administration, Washington, D. C.

EXPERIMENTAL RESEARCH ON THE STIRLING ENGINE

Yoshihiro Ishizaki, Yoshio Tani, and Narinori Haramura Jan. 1982 11 p Transl. into ENGLISH from Collected Papers of the Japan Soc. for Mech. (Japan), no. 790-16, Oct. 1979 p 111-113 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3541)

(NASA-TM-76672; NAS 1.15:76672) Avail: NTIS HC A02/MF A01 CSCL 10B

Experiments on Stirling engines of the 50 KW class were conducted to clarify the characteristics of the engine and its problems. The problems involve durability of the high temperature heat exchanger which is exposed to high flame temperatures above 1600 C, thermal distortion and high temperature corrosion of the devices near combustion, and of the preheater. N.W.

N82-22651*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

PERFORMANCE CHARACTERISTICS OF AN ELECTRIC VEHICLE LEAD-ACID BATTERY PACK AT ELEVATED TEMPERATURES

P. Chapman 1 Apr. 1982 42 p refs

(Contracts NAS7-100; DE-AI01-78CS-54209)

(NASA-CR-168818; JPL-Pub-82-25; JPL-5050-540; NAS 1.26:168818; DOE/CS-54209/9) Avail: NTIS HC A03/MF A01 CSCL 10C

Discharge testing data electric car battery pack over initial electrolyte temperature variations between 27 and 55 C are presented. The tests were conducted under laboratory conditions and then compared to detailed electric vehicle simulation models. Battery discharge capacity increased with temperature for constant current discharges, and battery energy capacity increased with temperature for constant power discharges. Dynamometer tests of the electric test vehicle showed an increase in range of 25% for the higher electrolyte temperature. S.L.

N82-22652*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

THE 19TH PROJECT INTEGRATION MEETING Progress Report, Jul. - Nov. 1981

R. R. McDonald Nov. 1981 397 p refs

(Contracts NAS7-100; DE-AI01-76ET-20356)

(NASA-CR-168822; JPL-Pub-82-11; DOE/JPL-1012-67; NAS 1.26:168822; PR-19) Avail: NTIS HC A17/MF A01 CSCL 10A

The Flat-Plate Solar Array Project is described. Project analysis and integration is discussed. Technology research in silicon material, large-area silicon sheet and environmental isolation; cell and module formation; engineering sciences, and module performance and failure analysis. It includes a report on, and copies of visual presentations made at, the 19th Project Integration Meeting held at Pasadena, California, on November 11, 1981. Author

N82-22653*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SOLAR POND POWER PLANT FEASIBILITY STUDY FOR DAVIS, CALIFORNIA

Y. C. Wu, M. J. Singer, H. E. Marsh, J. Harris, and A. L. Walton 15 Feb. 1982 73 p refs Prepared for the City of Davis, Calif.

(Contract NAS7-100)

(NASA-CR-168819; JPL-Pub-82-16; JPL-5107-4; NAS 1.26:168819) Avail: NTIS HC A04/MF A01 CSCL 10A

The feasibility of constructing a solar pond power plant at Davis, California was studied. Site visits, weather data compilation, soil and water analyses, conceptual system design and analyses, a material and equipment market survey, conceptual site layout, and a preliminary cost estimate were studied. It was concluded that a solar pond power plant is technically feasible, but economically unattractive. The relatively small scale of the proposed plant and the high cost of importing salt resulted in a disproportionately high capital investment with respect to the annual energy production capacity of the plant. Cycle optimization and increased plant size would increase the economical attractiveness of the proposed concept. R.J.F.

N82-22654*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SALTON SEA PROJECT, PHASE 1 Final Report

M. L. Peelgren 15 Jan. 1982 129 p refs

(Contracts NAS7-100; DE-AI01-79ET-20307)

(NASA-CR-168804; JPL-Pub-81-108; JPL-1060-54; JPL-5107-2; NAS 1.26:168804) Avail: NTIS HC A07/MF A01 CSCL 10A

A feasibility study was made for a salt gradient solar pond power plant in or near the Salton Sea of California. The conclusions support continuance 5-MWe proof-of-concept experiment, and ultimate construction by an electric utility company of a 600-MWe plant. The Solar Pond concept would be an environmental benefit to the Salton Sea by reversing the increasing salinity trend. The greatest cost drivers are the lake dike construction and pond sealing. Problems to be resolved include method of brine production from Salton Sea water for the first unit (which requires evaporation pond area and time), the high turbidity and color content of the Salton Sea water (which requires pretreatment), and other questions related to pond permeability, bio-activity and soil/brine chemical reactions. All technical and environmental problems appear solvable and/or manageable if care is taken in mitigating impacts. Author

N82-22655*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

PHOTOVOLTAICS AS A TERRESTRIAL ENERGY SOURCE. VOLUME 1: AN INTRODUCTION

Jeffrey L. Smith Oct. 1980 48 p refs 3 Vol.

(Contracts NAS7-100; DE-A101-79CS-30315)

(NASA-CR-168808; JPL-Pub-81-103-Vol-1; JPL-5220-15; NAS 1.26:168808; DOE/ET-20356/6-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 10A

Photovoltaic (PV) systems were examined their potential for terrestrial application and future development. Photovoltaic technology, existing and potential photovoltaic applications, and the National Photovoltaics Program are reviewed. The competitive environment for this electrical source, affected by the presence or absence of utility supplied power is evaluated in term of systems prices. The roles of technological breakthroughs, directed research and technology development, learning curves, and commercial demonstrations in the National Program are discussed. The potential for photovoltaics to displace oil consumption is examined, as are the potential benefits of employing PV in either central-station or non-utility owned, small, distributed systems. M.D.K.

N82-22656*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

PHOTOVOLTAICS AS A TERRESTRIAL ENERGY SOURCE. VOLUME 2: SYSTEM VALUE

Jeffrey L. Smith Oct. 1980 41 p refs 3 Vol.
(Contracts NAS7-100; DE-A101-79CS-30315)
(NASA-CR-168809; JPL-Pub-81-103-Vol-2; JPL-5220-15; NAS 1.26:168809; DOE/ET-20356/6-Vol-2) Avail: NTIS HC A03/MF A01 CSCL 10A

Assumptions and techniques employed by the electric utility industry and other electricity planners to make estimates of the future value of photovoltaic (PV) systems interconnected with U.S. electric utilities were examined. Existing estimates of PV value and their interpretation and limitations are discussed. PV value is defined as the marginal private savings accruing to potential PV owners. For utility-owned PV systems, these values are shown to be the after-tax savings in conventional fuel and capacity displaced by the PV output. For non-utility-owned (distributed) systems, the utility's savings in fuel and capacity must first be translated through the electric rate structure (prices) to the potential PV system owner. Base-case estimates of the average value of PV systems to U.S. utilities are presented. The relationship of these results to the PV Program price goals and current energy policy is discussed; the usefulness of PV output quantity goals is also reviewed. M.D.K.

N82-22657*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

PHOTOVOLTAICS AS A TERRESTRIAL ENERGY SOURCE. VOLUME 3: AN OVERVIEW

Jeffrey L. Smith Oct. 1980 41 p refs 3 Vol.
(Contracts NAS7-100; DE-AI01-79CS-30315)
(NASA-CR-168810; JPL-Pub-81-103-Vol-3; JPL-5220-15; NAS 1.26:168810; DOE/ET-20356/6-Vol-3) Avail: NTIS HC A03/MF A01 CSCL 10A

Photovoltaic (PV) systems were evaluated in terms of their potential for terrestrial application A comprehensive overview of important issues which bear on photovoltaic (PV) systems development is presented. Studies of PV system costs, the societal implications of PV system development, and strategies in PV research and development in relationship to current energy policies are summarized. M.D.K.

N82-22658*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

INTERCONNECT FATIGUE DESIGN FOR TERRESTRIAL PHOTOVOLTAIC MODULES

G. R. Mon, D. M. Moore, and R. G. Ross, Jr. 1 Mar. 1982 55 p refs
(Contracts NAS7-100; DE-AI01-76ET-20356)
(NASA-CR-168813; JPL-Pub-81-111; DOE/JPL-1012-62; JPL-1012-62; NAS 1.26:168813) Avail: NTIS HC A04/MF A01 CSCL 10A

The results of comprehensive investigation of interconnect fatigue that has led to the definition of useful reliability-design and life-prediction algorithms are presented. Experimental data indicate that the classical strain-cycle (fatigue) curve for the interconnect material is a good model of mean interconnect fatigue performance, but it fails to account for the broad statistical scatter, which is critical to reliability prediction. To fill this shortcoming the classical fatigue curve is combined with experimental cumulative interconnect failure rate data to yield statistical fatigue curves (having falure probability as a parameter) which enable (1) the prediction of cumulative interconnect failures during the design life of an array field, and (2) the unambiguous--ie., quantitative--interpretation of data from field-service qualification (accelerated thermal cycling) tests. Optimal interconnect cost-reliability design algorithms are derived based on minimizing the cost of energy over the design life of the array field. Author

N82-22659*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

HELICAL SCREW EXPANDER EVALUATION PROJECT Final Report

Richard McKay 1 Mar. 1982 457 p refs
(Contracts NAS7-100; DE-AI01-76ET-28329; EX-71-1-01-1000)
(NASA-CR-168803; JPL-Pub-82-5; NAS 1.26:168803; DOE/ET-28329/1) Avail: NTIS HC A20/MF A01 CSCL 10A

A one MW helical rotary screw expander power system for electric power generation from geothermal brine was evaluated. The technology explored in the testing is simple, potentially very efficient, and ideally suited to wellhead installations in moderate to high enthalpy, liquid dominated field. A functional one MW geothermal electric power plant that featured a helical screw expander was produced and then tested with a demonstrated average performance of approximately 45% machine efficiency over a wide range of test conditions in noncondensing, operation on two-phase geothermal fluids. The Project also produced a computer equipped data system, an instrumentation and contro van, and a 1000 kW variable load bank, all integrated into a test array designed for operation at a variety of remote test sites. Data are presented for the Utah testing and for the noncondensing phases of the testing in Mexico. Test time logged was 437 hours during the Utah tests and 1101 hours during the Mexico tests. S.L.

N82-22660*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

PHOTOVOLTAIC SYSTEMS TEST FACILITIES: EXISTING CAPABILITIES COMPILATION

Kent Volkmer 1 Mar. 1982 31 p
(Contracts NAS7-100; DE-AI01-76ET-20356)
(NASA-CR-168802; JPL-Pub-14-Rev-1; JPL-5240-3-Rev-A; NAS 1.26:168802; DOE/ET-20456/1-Rev-1) Avail: NTIS HC A03/MF A01 CSCL 10A

A general description of photovoltaic systems test facilities (PV-STFs) operated under the U.S. Department of Energy's photovoltaics program is given. Descriptions of a number of privately operated facilities having test capabilities appropriate to photovoltaic hardware development are given. A summary of specific, representative test capabilities at the system and subsystem level is presented for each listed facility. The range of system and subsystem test capabilities available to serve the needs of both the photovoltaics program and the private sector photovoltaics industry is given. R.J.F.

N82-22661*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

THEORY AND TESTS OF TWO-PHASE TURBINES

David G. Elliott 15 Mar. 1982 149 p refs
(Contract NAS7-100; DE-AI01-80ER-10614)
(NASA-CR-168834; JPL-Pub-81-105; NAS 1.26:168834; DOE/ER-10614/1) Avail: NTIS HC A07/MF A01 CSCL 10B

A theoretical model for two-phase turbines was developed. Apparatus was constructed for testing one- and two-stage turbines (using speed decrease from stage to stage). Turbines were tested with water and nitrogen mixtures and refrigerant 22. Nozzle efficiencies were 0.78 (measured) and 0.72 (theoretical) for water and nitrogen mixtures at a water/nitrogen mixture ratio of 68, by mass; and 0.89 (measured) and 0.84 (theoretical) for refrigerant 22 expanding from 0.02 quality to 0.28 quality. Blade efficiencies (shaft power before windage and bearing loss divided by nozzle jet power) were 0.63 (measured) and 0.71 (theoretical) for water and nitrogen mixtures and 0.62 (measured) and 0.63 (theoretical) for refrigerant 22 with a single stage turbine, and 0,70 (measured) and 0.85 (theoretical) for water and nitrogen mixtures with a two-stage turbine. Author

N82-22662*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
STIRLING LABORATORY RESEARCH ENGINE: PREPROTOTYPE CONFIGURATION REPORT
Frank W. Hoehn 15 Feb. 1982 92 p refs
(Contract NAS7-100)
(NASA-CR-168814; JPL-PUB-82-13; NAS 1.26:168814) Avail: NTIS HC A05/MF A01 CSCL 10B

The concept of a simple Stirling research engine that could be used by industrial, university, and government laboratories was studied. The conceptual and final designs, hardware fabrication and the experimental validation of a preprototype stirling laboratory research engine (SLRE) were completed. Also completed was a task to identify the potential markets for research engines of this type. An analytical effort was conducted to provide a stirling cycle computer model. The versatile engine is a horizontally opposed, two piston, single acting stirling engine with a split crankshaft drive mechanism; special instrumentation is installed at all component interfaces. Results of a thermodynamic energy balance for the system are reported. Also included are the engine performance results obtained over a range of speeds, working pressures, phase angles and gas temperatures. The potential for a stirling research engine to support the laboratory requirements of educators and researchers was demonstrated. R.J.F.

N82-22663*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CHARACTERIZATION OF SOLAR CELLS FOR SPACE APPLICATIONS. VOLUME 14: ELECTRICAL CHARACTERISTICS OF HUGHES LIQUID PHASE EPITAXY GALLIUM ARSENIDE SOLAR CELLS AS A FUNCTION OF INTENSITY, TEMPERATURE AND IRRADIATION
B. E. Anspaugh, R. G. Downing, T. F. Miyahira, and R. S. Weiss 15 Nov. 1981 123 p refs
(Contract NAS7-100)
(NASA-CR-168781; JPL-Pub-78-15-Vol-14; NAS 1.26:168781) Avail: NTIS HC A06/MF A01 CSCL 10A

Electrical characteristics of liquid phase epitaxy, P/N gallium aluminum arsenide solar cells are presented in graphical and tabular format as a function of solar illumination intensity and temperature. The solar cells were exposed to 1 MeV electron fluences of, respectively, 0, one hundred trillion, one quadrillion, and ten quadrillion e/sq cm. S.L.

N82-22664*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
REGIONAL APPLICABILITY AND POTENTIAL OF SALT-GRADIENT SOLAR PONDS IN THE UNITED STATES. VOLUME 1: EXECUTIVE SUMMARY
E. I. H. Lin 1 Mar. 1982 23 p 2 Vol.
(Contracts NAS7-100; DE-AI03-81SF-11552)
(NASA-CR-168805; JPL-Pub-82-10-Vol-1; DOE/JPL-1060-50-Vol-1; JPL-5107-1-Vol-1; NAS 1.26:168805) Avail: NTIS HC A02/MF A01 CSCL 10A

Findings of a survey concerning salt ponds are summarized. The residential, commercial, and institutional buildings sector is discussed. The industrial process heat sector is considered. The agricultural process heat sector is examined. The electrical power sector is reviewed. The desalinization sector is considered. N.W.

N82-22665*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
REGIONAL APPLICABILITY AND POTENTIAL OF SALT-GRADIENT SOLAR PONDS IN THE UNITED STATES. VOLUME 2: DETAILED REPORT
E. I. H. Lin et al 15 Mar. 1982 500 p refs 2 Vol.
(Contract NAS7-100; DE-AT04-80AL-13135)
(NASA-CR-168806; JPL-Pub-82-10-Vol-2; JPL-5107-1-Vol-2; DOE/JPL-1060-50-Vol-2; NAS 1.26:168806) Avail: NTIS HC A21/MF A01 CSCL 10A

A comprehensive assessment of the regional applicability and potential of salt-gradient solar ponds in the United States is provided. The assessment is focused on the general characteristics of twelve defined geographic regions. Natural resources essential to solar ponds are surveyed. Meteorological and hydrogeological conditions affecting pond performance are examined. Potentially favorable pond sites are identified. Regional thermal and electrical energy output from solar ponds is calculated. Selected pond design cases are studied. Five major potential market sectors are evaluated in terms of technical and energy-consumption characteristics, and solar-pond applicability and potential. Relevant pond system data and financial factors are analyzed. Solar-pond energy costs are compared with conventional energy costs. The assessment concludes that, excepting Alaska, ponds are applicable in all regions for at least two market sectors. Total solar pond energy supply potential in the five market sectors examined is estimated to be 8.94 quads/yr by the year 2000, approximately 7.2% of the projected total national energy demand. Author

N82-22666*# Acurex Corp., Mountain View, Calif. Energy and Environment Div.
COMPUTER MODEL OF CATALYTIC COMBUSTION/STIRLING ENGINE HEATER HEAD Final Report
E. K. Chu May 1981 186 p refs
(Contract DEN3-186; DE-AI01-77CS-51040)
(NASA-CR-165378; DOE/NASA/0186-1; NAS 1.26:165378; FR-81-75/EE) Avail: NTIS HC A09/MF A01 CSCL 10B

The basic Acurex HET code was modified to analyze specific problems for Stirling engine heater head applications. Specifically, the code can model: an adiabatic catalytic monolith reactor, an externally cooled catalytic cylindrical reactor/flat plate reactor, a coannular tube radiatively cooled reactor, and a monolithic reactor radiating to upstream and downstream heat exchangers. T.M.

N82-22667# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
UTILITY SITING OF WECS: A PRELIMINARY LEGAL/REGULATORY ASSESSMENT
Robert J. Noun, Michael Lotker (Synectics Group, Inc.), and H. Paul Frieseman (Inst. of Ecology) May 1981 103 p refs
(Contract EG-77-C-01-4042)
(SERI/TR-744-778) Avail: NTIS HC A06/MF A01

The early experiences of several utilities in dealing with the legal and regulatory issues that were raised in the process of siting wing energy installations were examined. Recommendations are made as to how utilities can begin to address many of the identified issues. Two issues associated with utility siting of wind machines are cited: (1) land acquisition and use and (2) aesthetic controls. Land use control regulations dealing with incompatible uses, nuisance factors, building scale limitations, and on site environmental impacts many constrain wind machine siting by utilities. The siting issue of greatest concern is how the public will react to the hard reality of wind power development. Little public opposition to wind energy projects is raised to date, yet it is possible that local attitudes will change as the novelty of the early single unit machines wears off. It is concluded that potentially adverse impacts based on local aesthetic concerns can be minimized by careful planning, siting, and design by utility developers and by close coordination with local planning and regulatory officials. E.A.K.

N82-22668# Midwest Research Inst., Golden, Colo.
THE TRADE-OFF BETWEEN COLLECTOR AREA, STORAGE VOLUME, AND BUILDING CONSERVATION IN ANNUAL STORAGE SOLAR HEATING SYSTEMS
Sanford Sillman Mar. 1981 123 p refs
(Contract EG-77-C-01-4042)
(SERI/TR-721-907) Avail: NTIS HC A06/MF A01

A comprehensive study based on computer simulation of the performance of active solar heating systems with large storage tanks was made. The investigation focused on systems used to supply backup heat to passive solar and energy-conserving buildings as well as systems designed to meet standard heating loads. Results show that system performance increases linearly as storage volume is increased, up to the point where the storage tank is large enough to store all heat collected in summer. The optimal design for annual storage systems is discussed and a contrast with diurnal storage systems is made. It is suggested that the annual storage systems may be economically preferable to the diurnal systems. M.D.K.

N82-22669# Argonne National Lab., Ill. Pulsed Neutron Source Program.
CALCULATIONS OF THE HEAT DEPOSITION AND THE

EXPECTED RATE OF TEMPERATURE RISE IN MODERATOR, REFLECTOR AND DECOUPLER MATERIALS FOR IPNS-I

M. Kimura, J. M. Carpenter, and D. F. R. Mildner (Missouri Univ., Columbia) Apr. 1981 33 p refs
(W-31-109-eng-38)
(ANL-81-22) Avail: NTIS HC A03/MF A01

The neutron and gamma fluxes at the center of a moderator and their average energies were estimated for the IPNS-I configuration 5 trillion ppp, 500 MeV, 30 Hz with U-238 target). The gamma decay factor, the ratio of gamma intensity when a proton beam is on, to that of just after beam off, was calculated. The heat deposition rate in the moderator and the temperature rise without heat flow are estimated to be 41.1 mW/cc and 1.13 K/min respectively, for a polyethylene moderator. Estimates for liquid hydrogen moderators give 17.3 mW/cc and 2.1 K/min respectively. Estimates are also made for the heat deposition rates in the boron and cadmium decouplers. Some consideration was given to the thermal characteristics (cooling constant, etc.) of various materials in conjunction with the ZING P' measurements. The possible temperature difference between moderator and a thermocouple was estimated and found to be very small. S.L.

N82-22670# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

THE TRADE-OFF BETWEEN COLLECTOR AREA, STORAGE VOLUME AND BUILDING CONSERVATION IN ANNUAL STORAGE SOLAR HEATING SYSTEMS

Sanford Sillman Apr. 1981 6 p refs Presented at AS/ISES Conf. and Exposition, Philadelphia, 26-30 May 1981
(Contract EG-77-C-01-4042)
(SERI/TR-721-907) Avail: NTIS HC A02/MF A01

A comprehensive computer simulation of the performance of active solar heating systems with long term hot water storage. Systems used to supply backup heat to passive solar and energy conserving buildings, as well as to meet standard heating and hot water loads were investigated. It is shown that system output increases linearly as storage volume increases, up to the point where the storage tank is large enough to store all heat collected in summer. This point, the point of unconstrained operation, is the likely economic optimum. Unlike diurnal storage systems, annual storage systems show only slightly diminished efficiency as system size increases. In contrast to diurnal systems, annual storage systems perform efficiently in meeting the load of a passive or energy efficient building. E.A.K.

N82-22671# Little (Arthur D.), Inc., Cambridge, Mass.

NEAR-TERM HIGH POTENTIAL COUNTIES FOR SWECS Final Report

William C. Osborn and William T. Downey Golden, Colo. Midwest Research Inst. Feb. 1981 103 p refs Prepared for Midwest Research Inst., Golden, Colo.
(Contract EG-77-C-01-4042)
(SERI/TR-98282-11) Avail: NTIS HC A06/MF A01

Up-to-date market information to manufacturers of small wind energy conversion system (SWECS) to assist them in developing marketing strategies for their products are provided. The data are arranged in a format that permits rapid identification of a particular location or market segment for further investigation. Extensive backup information by state and county in state SWECS Market reports are appended. It is suggested that the information are useful to SWECS manufacturers for planning new marketing and advertising activities. Background information essential to market studies is synthesized and an initial framework to start such a study is provided. Author

N82-22672*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

IMPROVED CHROMIUM ELECTRODES FOR REDOX CELLS Patent Application

Vinod Jalan (Giner, Inc.), Margaret A. Reid, and Jo Ann Charleston, inventors (to NASA) Filed 26 Feb. 1982 13 p
(NASA-Case-LEW-13653-1; US-Patent-Appl-SN-352821) Avail: NTIS HC A02/MF A01 CSCL 10C

An improved electrode having a gold coating for use in the anode compartment of a REDOX cell is described. The anode fluid utilizes a chromic/chromous couple. A carbon felt is soaked in methanol, rinsed in water, dried and then heated in KOH after which it is again washed in deionized water and dried. The felt is then moistened with a methanol water solution containing chloroauric acid and is stored in a dark place while still in contact with the gold-containing solution. After all the gold-containing solution is absorbed in the felt, the latter is dried by heat and then heat treated at a substantially greater temperature. The felt is then suitable for use as an electrode and is wetted with water or up to two molar HCl prior to installation in a REDOX cell. The novelty of the invention lies in the use of KOH for cleaning the felt and the use of alcohol as a carrier for the gold together with the heat treating procedure. NASA

N82-22673*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LIGHT WEIGHT NICKEL BATTERY PLAQUE Patent Application

M. A. Reid, R. E. Post, and D. G. Soltis, inventors (to NASA) Filed 19 Feb. 1982 9 p
(NASA-Case-LEW-13349-1; US-Patent-Appl-SN-350476) Avail: NTIS HC A02/MF A01 CSCL 10C

Fabrication of a nickel plaque which may be coated with another suitable metal or compound to form an electrode for use in a fuel cell or battery is described. A flexible, porous, platable, plastic substrate is positioned against a diffuser together with an apertured support plate in a conduit. Flanges are clamped together on gaskets which prevent leakage of fluid from the conduit for bypassing of the substrate by the fluid. Treatment solutions are directed under pressure from a container by a pump through the substrate, diffuser and apertured support to a treatment solution collector. The treatment solutions are first a sensitizer, then distilled water, a catalyst solution, distilled water and, lastly, a nickel plating bath solution. T.M.

N82-22674*# Norlin Industries, Inc., Carlisle, Pa.

SLICING OF SINGLE CRYSTAL AND POLYCRYSTALLINE SILICON INGOTS USING MULTI-BLADE SAWS Final Report, 3 Jan. - 3 Jul. 1980

Jack B. Ross 23 May 1980 24 p
(Contract JPL-955563)
(NASA-CR-168763; DOE/JPL/955563/1; JPL-9950-359; NAS 1.26:168763) Avail: NTIS HC A02/MF A01 CSCL 10A

Optimization of the Multi-Blade Slurry wafering technique was evaluated. Several wafering runs were made. Sufficient data necessary for a complete cost analysis of each of the three types of saw utilized are provided. N.W.

N82-22675*# ECO, Inc., Cambridge, Mass.

CATHODE CATALYST FOR PRIMARY PHOSPHORIC FUEL CELLS Quarterly Report, Jul. - Sep. 1980

Fraser Walsh Sep. 1980 17 p refs
(Contract DEN3-150)
(NASA-CR-165198; DOE/NASA/0150-80/5; NAS 1.26:165198) Avail: NTIS HC A02/MF A01 CSCL 10A

Alkylation of Vulcan XC-72 provided the most stable bond type for linking CoTAA to the surface of the carbon; this result is based on data obtained by cyclic voltammetry, pulse voltammetry and by release of 14C from bonded CoTAA. Half-cell tests at 100 C in 85% phosphoric acid showed that CoTAA bonded to the surface of carbon (Vulcan XC-72) via an alkylation procedure is a more active catalyst than is platinum based on a factor of two improvement in Tafel slope; dimeric CoTAA has catalytic activity equal to platinum. Half-cell tests also showed that bonded CoTAA catalysts do not suffer a loss in potential when air is used as a fuel rather than oxygen. Commercially available PTFE was shown to be stable for four months in 200 C 85% phosphoric acid based on lack of change in surface wetting properties, IR and physical characteristics. When stressed electrochemically in 150 C 85% phosphoric acid, PTFE also showed no changes after one month. Author

N82-22676*# National Aeronautics and Space Administration, Washington, D. C.

THE FINAL PROCEEDINGS OF THE SOLAR POWER SATELLITE PROGRAM REVIEW

Jul. 1980 701 p refs Rev. held in Lincoln, Nebr., 22-25 Apr. 1980

(Contract DE-FG05-79ER-10116)
(NASA-TM-84183; NAS 1.15:84183; CONF-800491) Avail: NTIS HC A99/MF A01 CSCL 10A

The solar power satellite (SPS) concept defined as 'placing gigantic satellites in geosynchronous orbit to capture sunlight, changing the energy into an appropriate form for transmission to Earth, and introducing the energy into the electric power grid' is evaluated in terms of costs and benefits. The concept development and evaluation program is reviewed in four general areas: systems definition; environmental; societal; and comparative assessments. Specific factors addressed include: transportation, construction in space, methods of conversion of sunlight into energy, transmission to Earth, maintenance in orbit and decommissioning of satellites; environmental, political, and economic effects; and comparison of SPS to other forms of power generation, both terrestrial and in space. For individual titles, see N82-22677 through N82-22767.

N82-22677*# National Aeronautics and Space Administration, Washington, D. C.
OVERVIEW OF SYSTEMS DEFINITION ACTIVITIES FOR SATELLTE POWER SYSTEMS
F. Carl Schwenk *In its* The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 21-35 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Studies conducted by NASA of the Satellite Power System were reviewed and included considerations of the role of SPS as an energy system, space technology, ground systems, and environmental concerns. Various space transportation systems for placement of the SPS in an operational mode are discussed. T.M.

N82-22678*# Argonne National Lab., Ill.
ENVIRONMENTAL ASSESSMENT OVERVIEW
A. R. Valentino *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 37-53 refs (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The assessment program has as its objectives: to identify the environmental issues associated with the SPS Reference System; to prepare a preliminary assessment based on existing data; to suggest mitigating strategies and provide environmental data and guidance to other components of the program as required; and to plan long-range research to reduce the uncertainty in the preliminary assessment. The key environmental issues associated with the satellite power system are discussed and include human health and safety, ecosystems, climate, and interaction with electromagnetic systems. T.M.

N82-22679*# PRC Systems Sciences Co., Los Angeles, Calif.
SOCIETAL ASSESSMENT OVERVIEW
Charles E. Bloomquist *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 54-77 refs (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The decision to proceed with SPS depends on a political determination that commitment of the economic, institutional, and social energies required for its implementation is a worthwhile investment. This determination is national (and international) in scope and is based on knowledge of the environmental and societal impacts of the SPS, its projected economics and technological risks, expressed through the influence of contending segments of society. To assist the decision makers, an assessment of societal issues associated with the SPS was undertaken as part of the Concept Development and Evaluation Program. Results of the assessment are reported. The primary societal assessment objectives are to determine if the societal ramifications of an SPS might significantly impede its development, and to establish an information base regarding these issues. Estimates regarding SPS impacts commensurate with its stage of development and the needs of the decision makers are provided. T.M.

N82-22680*# European Space Research and Technology Center, Noordwijk (Netherlands).
AN OVERVIEW ON EUROPEAN SPS ACTIVITIES
K. K. Reinhartz *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 78-87 refs (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The organization of space and energy research in Europe is discussed. The European situation is highlighted with emphasis on the dependency of energy imports and on the energy requirements of Europe. The status of SPS research in the countries that form the European Space Agency was reviewed. It is concluded that in view of the unfavorable geographical and climatic situation of large parts of Europe, terrestrial solar energy conversion is unlikely to make a significant contribution to Europe's future energy supply. Thus, SPS development is of special interest to the European community. T.M.

N82-22681*# Saint Olaf Coll., Northfield, Minn.
SPS ISSUES: THE NEED TO LOOK AHEAD
Kevin K. Dybdal *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 88-90 refs (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The need for a systematic examination of SPS for the purpose of identifying potential problem areas and the issues related to those areas, is considered. The use of a systemic approach, a valuable perspective from which to evaluate SPS implementation as a reliable, safe, and cost efficient energy supply of the future, is discussed. M.D.K.

N82-22682*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPS OVERVIEW: REQUIREMENTS, ALTERNATIVES, AND REFERENCE SYSTEM
L. E. Livingston *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 91-94 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Basic requirements for the SPS were established. The SPS is considered to be nondepletable with a large positive energy payback over its useful life, capable of base-load operation with no fundamental constraints on capacity. It is compatible with power grids, economically competitive and environmentally acceptable. It should not make excessive use of critical resources, and should be capable of development with reasonable cost, time, and risk. Several of the power generation options and equipment considered are discussed. The reference set of efficiencies defined to represent goals for each step in the power conversion-transmission-reception chain is also described. M.D.K.

N82-22683*# Rockwell International Corp., Downey, Calif.
EMERGING SPS CONCEPTS
G. Hanley and G. R. Woodcock (Boeing Co., Seattle) *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 95-98 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Four technologies were evaluated to determine their effect on Satellite Power System concepts. Two of these technologies, solid-state power amplifiers and magnetrons, are replacements for the Klystrons used for dc to RF conversion on the satellite. A third technology, laser power transmission, transmits the energy at laser frequencies rather than microwave frequencies. The fourth technology, multibandgap solar cells, has the promise of significantly increased solar to dc conversion efficienty as compared to the reference-concept silicon and gallium arsenide solar cells. The design characteristics of concepts resulting from application of these technologies are summarized. M.G.

N82-22684*# General Electric Co., Schenectady, N. Y.
INTEGRATION OF SPS WITH UTILITY SYSTEM NETWORKS
Bjorn M. Kaupang *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 99-102 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The integration of Satellite Power System (SPS) power in electric utility power systems is discussed. Specifically, the nature of the power output variations from the spacecraft to the rectenna, the operational characteristics of the rectenna power, and the impacts on the electric utility system from utilizing SPS power

to serve part of the system load are treated. It is concluded that if RF beam control is an acceptable method for power control, and that the site distribution of SPS rectennas do not cause a very high local penetration (40 to 50%), SPS may be integrated into electric utility system with a few negative impacts. Increased regulating duty on the conventional generation, and a potential impact on system reliabiliity for SPS penetration in excess of about 25% appear to be two areas of concern. M.G.

N82-22685*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPS COST METHODOLOGY AND SENSITIVITIES
Robert O. Piland *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 103-106 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

A total solar power satellite is defined and costs for such a program estimated. The program is assumed to consist of a number of phases from initial research to the completed production unit. Each phase represents an increasing commitment of resources as confidence in the ultimate success of the program grows. The total cost of the program through the first full-scale unit is estimated to be slightly over 100 billion dollars. The subsequent units are estimated to cost an average of 11.5 billion dollars per unit. M.G.

N82-22686*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPS TECHNICAL ISSUES
C. H. Guttman *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 107-108 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The technical issues which would either seriously impact or potentially negate the integrity of a solar power satellite program are enumerated. Issues are identified not only relating to the question of engineering feasibility, but also to the equally important areas of environmental and social acceptability and, especially, economic viability. Specific information required for resolution of the issues was developed and a planned overall approach for resolution was identified. Results of these analyses show that 60% of the technical issues can be resolved with analysis only; 10% require only ground testing for resolution; and the remaining 30% require space experiments or demonstrations for resolution. The results also show that 85% resolution of the issues may be accomplished prior to development of a protoype. M.G.

N82-22687*# European Space Technology Center, Noordwijk (Netherlands). Systems Engineering Dept.
CRITICAL TECHNOLOGY AREAS OF AN SPS DEVELOPMENT AND THE APPLICABILITY OF EUROPEAN TECHNOLOGY
D. Kassing and J. Ruth *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 109-112 refs (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Possible system development and implementation scenarios for the hypothetical European part of a cooperative Satellite Power System effort are discussed, and the technology and systems requirements which could be used as an initial guideline for further evaluation studies are characterized. Examples of advanced European space technologies are described including high power microwave amplifiers, antennas, advanced structures, multi-kilowatt solar arrays, attitude and orbit control systems, and electric propulsion. L.F.M.

N82-22688*# Argonne National Lab., Ill.
OVERVIEW OF ATMOSPHERIC EFFECTS
Donald M. Rote *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 113-115 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Effluents from the transportation system are the major cause of Satellite Power System related atmospheric effects. These effects are discussed and include inadvertent weather modification, air quality degradation, compositional changes in the stratosphere and mesosphere, formation of noctilucent clouds, plasma density changes, airglow enhancements, and changes in composition and dynamics of the plasmasphere and magnetosphere. L.F.M.

N82-22689*# Institute for Telecommunication Sciences, Boulder, Colo.
IONOSPHERIC DISTURBANCE OVERVIEW
C. M. Rush *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 116-119 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

A program of research and exploratory development was undertaken to assess the potential impact of Satellite Power System operation on the ionosphere. The program relies on the utilization of ground-based ionospheric heating facilities in order to simulate the ionospheric heating that will come from the Satellite Power System. Thus far, the experimental program directed toward assessing telecommunications impacts has received the most attention, and little impact was observed on VLF, LF, and MF operations. L.F.M.

N82-22690*# Pacific Northwest Lab., Richland, Wash.
ELECTROMAGNETIC COMPATIBILITY OVERVIEW
K. C. Davis *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 120-121 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

An assessment of the electromagnetic compatibility impact of the Satellite Power System is discussed. The discussion is divided into two parts: determination of the emission expected from SPS including their spatial and spectral distributions, and evaluation of the impact of such emissions on electromagnetic systems including considerations of means for mitigating effects. L.F.M.

N82-22691*# California Univ., Berkeley. Lawrence Berkeley Lab.
NONMICROWAVE HEALTH AND ECOLOGICAL EFFECTS: OVERVIEW
Margaret R. White *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 122-123 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The potential environmental impacts due to the operation and construction of the Satellite Power System are discussed. The nonmicrowave health and ecological effects encompass impacts on the public, the terrestrial worker, the space worker, the ecology, and agriculture. L.F.M.

N82-22692*# Environmental Protection Agency, Research Triangle Park, N.C. Experimental Biology Div.
SPS MICROWAVE HEALTH AND ECOLOGICAL EFFECTS: PROGRAM AREA OVERVIEW
Daniel F. Cahill *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 124 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The potential microwave health and ecological effects due to the operations of the Satellite Power System are discussed. An outline of the research needed to insure public acceptance of the program is presented. L.F.M.

N82-22693*# PRC Energy Analysis Co., Los Angeles, Calif.
AN EVALUATION OF THE LAND AND MATERIAL REQUIREMENTS FOR THE SATELLITE POWER SYSTEM
Samuel D. Ankerbrandt *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 125-128 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Current research and evaluation of the physical resources requirements for the Satellite Power System (SPS) concentrates on three topics: land requirements and the siting of rectennas; the environmental impacts of the rectenna siting; and the materials requirements. The first two focus exclusively on the Earth based element of the SPS while the materials assessment considered requirements for both the space and Earth systems. L.F.M.

N82-22694*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

REFERENCE SYSTEM CHARACTERIZATION AND COST OVERVIEW

Robert O. Piland *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 142-145 refs (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

A brief description of the necessary elements of the Satellite Power System is presented. This reference system provides the basis for making preliminary cost estimates. L.F.M.

N82-22695*# Argonne National Lab., Ill.
SPS AND ALTERNATIVE TECHNOLOGIES COST AND PERFORMANCE EVALUATIONS

Michael E. Samsa *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 148-149 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Cost estimates for production of the electrical energy needed in the early twenty-first century are provided. Costs and performance of the Satellite Power System are compared with alternative methods of producing electrical energy. L.F.M.

N82-22696*# Argonne National Lab., Ill.
COMPARATIVE HEALTH AND SAFETY ASSESSMENT OF THE SPS AND ALTERNATIVE ELECTRICAL GENERATION SYSTEMS

L. J. Habegger, J. R. Gasper, and C. D. Brown *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 150-153 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

A comparative analysis of health and safety risks is presented for the Satellite Power System and five alternative baseload electrical generation systems: a low-Btu coal gasification system with an open-cycle gas turbine combined with a steam topping cycle; a light water fission reactor system without fuel reprocessing; a liquid metal fast breeder fission reactor system; a central station terrestrial photovoltaic system; and a first generation fusion system with magnetic confinement. For comparison, risk from a decentralized roof-top photovoltaic system with battery storage is also evaluated. Quantified estimates of public and occupational risks within ranges of uncertainty were developed for each phase of the energy system. The potential significance of related major health and safety issues that remain unquantitied are also discussed. M.D.K.

N82-22697*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPS STRUCTURES AND CONTROL: A PERSPECTIVE

Robert C. Ried *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 164-167 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The characteristics and design requirements for the structure and control systems for a solar power satellite were evaluated. A simplistic, indicative analysis on a representative configuration was developed. Representative configuration masses and dimensions are given in convenient approximate magnitudes. The significance of structure control interaction and the significance of stiffness to the minimization of dynamic energy was demonstrated. It was found that the thermal environment for the SPS was dominated by solar radiation and waste heat rejection by the antenna. A more in-depth assessment of the control system design and associated system performance is still needed, specifically the inter-relatonships between control sensors, actuators, and structural response. M.D.K.

N82-22698*# Rockwell International Corp., Downey, Calif.
SPS ATTITUDE CONTROL AND STATIONKEEPING: REQUIREMENTS AND TRADEOFFS

R. E. Oglevie *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 168-171 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The dominant control requirements of solar power satellites change appreciably relative to small contemporary spacecraft. Trade studies and analyses illustrated preferred control approaches. It was found that the geosynchronous equatorial orbit is preferred over the alternative orbits considered, that the solar pressure orbit perturbation dominates stationkeeping propulsion requirements and that a combined AC and SK system using ion electric propulsion can satisfy the attitude control requirements. It was also found that control system/structural dynamic interaction stability can be obtained through frequency separation with reasonable structural dynamic requirements and simplify spacecraft design. M.D.K.

N82-22699*# Rockwell International Corp., Downey, Calif.
SATELLITE POWER SYSTEMS STRUCTURES: A 1980 TECHNOLOGY STATUS REVIEW

H. Stanley Greenberg *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 172-175 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The classes of major structural components and constructions utilized were considered. A review of the current (SPS) structure technology status was made. The major issues considered pertinent to SPS structures are: Cost effective construction, construction materials, structural design requirements, stress and dimensional integrity of as-built structures, and predictability of strength and dynamic behavior. The feasibility of passive figure control approach to MPTS flatness, of structure stiffness compatible with MPTS pointing, of passive control through damping, and the feasibility of space fabrication of ultra-large reflector surfaces are also considered. Qualification, model verification, inspection are considered of vital concern. M.D.K.

N82-22700*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DYNAMICS AND CONTROL OF THE SATELLITE POWER SYSTEM

S. J. Wang, J. N. Juang, and G. Rodriquez *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 176-179 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

An investigation of the dynamics and control problems specifically related to the Satellite Power System (SPS), to assess performance of selected control concepts, and to identify and initiate development of advanced control technology that would enhance feasibility and performance of the SPS system was made. The initial stages of the study are reported. M.D.K.

N82-22701*# Grumman Aerospace Corp., Bethpage, N.Y.
A MODERN CONTROL APPROACH TO THE DESIGN OF THE SPS CONTROL SYSTEM

Richard Gran *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 180-183 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The structural dynamics of the solar power satellite were considered. The requirements on the vibration of the microwave antenna and the possibility of thermal induced vibration and severe structural-thermal interactions were considered. The possibility of using an active control system and modern control methods to mitigate structural problems is discussed. M.D.K.

N82-22702*# Bechtel National, Inc., San Francisco, Calif.
THE DESIGN OF LOW COST STRUCTURES FOR EXTENSIVE GROUND ARRAYS

H. A. Franklin and R. S. Leonard *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 185-188 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The development of conceptual designs of solar array support structures and their foundations including considerations of the use of concrete, steel, aluminum, or timber are reported. Some cost trends were examined by varying selected parameters to determine optimum configurations. Detailed civil/structural design criteria were developed. Using these criteria, eight detailed designs for support structures and foundations were developed and cost estimates were made. As a result of the study wind was identified as the major loading experienced by these low height structures, whose arrays are likely to extend over large tracts of land. Proper wind load estimating is considered essential to developing realistic structural designs and achieving minimum cost support structures. Wind tunnel testing of a conceptual array field was undertaken

and some of the resulting wind design criteria are presented. The SPS rectenna system designs may be less sensitive to wind load estimates, but consistent design criteria remain important. M.D.K.

N82-22703*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPS STRUCTURAL DYNAMICS AND CONTROL WORKSHOP: FINDINGS AND RECOMMENDATIONS
R. C. Ried and D. L. Mingori (California Univ., L.A.) *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 169-192 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The structural dynamics and control of the Solar Power Satellite (SPS), a concept which holds promise for meeting a portion of the energy needs of the United States beyond the year 2000 are examined. The assumptions, methodologies and conclusions of existing SPS studies in the areas of structural dynamics and control (with structural design and materials also being considered) are assessed. N.W.

N82-22704*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPS PROGRAM REVIEW TRANSPORTATION PERSPECTIVE
William W. Wales, Jr. *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 193-195 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The delivery of cargo and space workers to the SPS construction site requires the development of two different systems, one to handle large cargo deliveries and a smaller system to accommodate crew. The overall scenario of the transportation system is shown. Eight major elements comprise the transportation system: personnel launch vehicle (PLV) or shuttle; personnel orbital transfer vehicle (POTV); the heavy lift launch vehicle (HLLV); the electric orbital transfer vehicle (EOTV); intra orbit transfer vehicle (IOTV); LEO support facility; GEO support facility and a shuttle derived HLLV (SDHLLV) for supporting the early SPS Demonstration Program. The HLLV and EOTV represent the cargo carriers while the PLV and POTV represent the people carriers. The IOTV is utilized to ferry people and cargo modules over short distances in the vicinity of its station. J.M.S.

N82-22705*# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
MINIMUM COST CRITERIA FOR SPS TRANSPORTATION TO GEO
Dietrich E. Koelle *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 196-199 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The application of cost optimization to vehicle design is discussed relative to establishing ground rules for a minimum cost heavy cargo launch vehicle to transport the Satellite Power System to geosynchronous orbit. Criteria defined include: fully reusable; unmanned; technical simplicity; and operations simplicity. Graphs are presented depicting (1) the launch vehicle concept schematic, (2) the cost comparison, (3) the launch vehicle sizing, and (4) the specific transportation cost. J.M.S.

N82-22706*# Boeing Aerospace Co., Seattle, Wash.
EARTH-TO-ORBIT TRANSPORTATION FOR SOLAR POWER SATELLITES
Gordon R. Woodcock and Gerald Hanley (Rockwell International, Downey, Calif.) *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 200-203 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The cargo transport capability and the cost of space transportation operations for transportation of solar power satellites (SPS) to space are addressed. The history of SPS launch vehicle evolution is shown. Alternative vehicle designs developed include: (1) a parallel burn, crossfeed configuration; (2) single stage to orbit airbreathing/rocket runway takeoff vehicle concept; and (3) a smaller HLLV concept. The smaller HLLV was analyzed to compare the nonrecurring cost benefits of a less challenging development with the recurring cost increases expected due to losses in efficiency associated with smaller vehicle size. The vehicle payload bay size was selected to be adequate to accommodate the SPS transmitter subarrays fully assembled. The resulting vehicle design is compared with the shuttle, the Saturn V, and the reference SPS HLLV. A nonrecurring savings of at least five billion dollars was obtained with a recurring cost penalty of 3% per SPS. The environmental benefits of the small vehicle were deemed more important than the slight increase in upper atmosphere propellant deposition. It is recommended that the small HLLV be adopted as the SPS reference launch system. J.M.S.

N82-22707*# Rockwell International Corp., Downey, Calif. Space Operations and Satellite Systems Div.
ORBIT TO ORBIT TRANSPORTATION
R. P. Bergeron *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 204-207 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Orbital transfer vehicle propulsion options for SPS include both chemical (COTV) and electrical (EOTV) options. The proposed EOTV construction method is similar to that of the SPS and, by the addition of a transmitting antenna, may serve as a demonstration or precursor satellite option. The results of the studies led to the selection of a single stage COTV for crew and priority cargo transfer. An EOTV concept is favored for cargo transfer because of the more favorable orbital burden factor over chemical systems. The gallium arsenide solar array is favored over the silicon array because of its self annealing characteristics of radiation damage encountered during multiple transitions through the Van Allen radiation belt. Transportation system operations are depicted. A heavy lift launch vehicle (HLLV) delivers cargo and propellants to LEO, which are transferred to a dedicated EOTV by means of an intraorbit transfer vehicle (IOTV) for subsequent transfer to GEO. The space shuttle is used for crew transfer from Earth to LEO. At the LEO base, the crew module is removed from the shuttle cargo bay and mated to a COTV for transfer to GEO. Upon arrival at GEO, the SPS construction cargo is transferred from the EOTV to the SPS construction base by IOTV. Crew consumables and resupply propellants are transported to GEO by the EOTV. Transportation requirements are dominated by the vast quantity of materials to be transported to LEO and GEO. J.M.S.

N82-22708*# Brown and Root, Inc., Houston, Tex.
OFFSHORE SPACE CENTER (OFFSHORE LAUNCH SITE)
Donald G. Harvey *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 208-209 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Any activity requiring the development of the HLLV can benefit by operations from an offshore space center (OSC) since operating near the equator provides a twenty percent increase in payload in an ecliptic plan orbit. Some OSC concepts considered include a moored floating (semisubmersible) design, a stationary design supported by fixed piles, and a combination of these two. The facility supports: a 15,000 foot long, 300 foot wide runway, designed to accommodate a two staged winged launch vehicle, with a one million pound payload capacity to low earth orbit; an industrial area for HLLV maintenance; an airport terminal, control and operation center, and observation tower; liquid hydrogen and liquid oxygen production and storage, and fuel storage platforms; a power generation station, docks with an unloading area; two separate launch sites; and living accommodations for 10,000 people. Potential sites include the Paramount Seamount in the Pacific Ocean off the north coast of South America. Cost estimates are considered. A.R.H.

N82-22709*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE APPLICABILITY OF MFD THRUSTERS TO SATELLITE POWER SYSTEMS
R. M. Jones and L. K. Rudolph *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 210-213 (For primary document see N82-22676 13-44)
(Contract NAS7-100)

Avail: NTIS HC A99/MF A01 CSCL 10A

The high power self field MPD thruster uses electromagnetic forces rather than electrostatic to accelerate a neutral plasma. The most attractive application of MPD thrusters to satellite power systems is in the area of electric propulsion for a cargo orbit transfer vehicle (COTV). Calculations were performed in order to compare the performance of a COTV using an ion or MPD propulsion system. Results show that the MPD propulsion system gives a shorter trip time with the same power and payload when compared to the ion thruster propulsion system at either value of specific impulse. More important than the trip time benefit may be the advantage a MPD propulsion system provides in system simplicity. Another interesting COTV concept using MPD thrusters is the use of a remote power supply located on the Earth, at GEO, or somewhere in between to transmit power to the COTV in a microwave transmission. The specific impulse at thrust levels of tens of newtons makes a MPD propulsion system a candidate for stationkeeping and attitude control of large space structures such as a SPS. A.R.H.

N82-22710*# Layton (J. Preston), Princeton Junction, N.J.
SATELLITE POWER SYSTEMS (SPS) SPACE TRANSPORTATION WORKSHOP SUMMARY
J. Preston Layton *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 214-215 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Space transportation requirements are major elements in the technical and economic realization of the entire SPS concept. First, steps in enhancing the shuttle include the Titan based liquid boost module (LBM) and liquid propellant boosters (LPB) to replace the present solid rocket boosters (SRB). The next choice between new ballistic or winged boosters must still be made; as well as the choice between series (staged) and parallel operation. Entirely new vehicles of large size are required before the economic and environmental problems of the prototype, or even demonstration, SPS can be resolved. Social impacts such as noise, and atmospheric pollution, locally and in the ionosphere, must be fully addressed. Although rather advanced technology and well developed operational management is required to properly target the average cost of gross cargo payloads into LEO at 30 $ (1979)/kg for the construction of the initial SPS, the further goal for repetitive construction of 30 to 60 SPS at 15 $ (1979)/kg for all operational payloads require the use of very advanced, long lived vehicles with a sophisticated operational organization using off shore, equatorial launch sites. A.R.H.

N82-22711*# Little (Arthur D.), Inc., Cambridge, Mass.
TECHNOLOGY ALTERNATIVES FOR THE SPS
P. Glaser and P. K. Chapman *In* NASA, Washington The Final Proc. of the Solid Power Satellite Program Rev. Jul. 1980 p 216-218 refs (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Emerging technologies may offer advantages over those selected for the reference design adopted for the SPS. While it is not possible to list all the technological innovations that may affect the SPS, it is feasible to develop a systematic methodology for assessing technical alternatives. This may be of value in evaluating proposed technologies and identifying high priority areas for research. Such a methodology includes involves (1) variation of guidelines; (2) analysis of system functions; (3) analysis of system sensitivity; (4) analysis of technology status and risk; and (5) external costs, problem areas, and criticisms of the SPS concept. The methodology is a first step towards the creation of a formal decision analytic framework which can support design choices and program decisions as development proceeds. A.R.H.

N82-22712*# Boeing Aerospace Co., Seattle, Wash.
PROTOTYPE SOLAR POWER SATELLITE OPTIONS
B. R. Sperber and K. E. Drexler (MIT) *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 219-222 refs (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The choice of options for the prototype solar power satellite is addressed relative to risk and cost. Emphasis is placed on the reduction of the risk of failure. Risk is the program cost multiplied by the reduction in probability of program success due to the risky action. Four classes of risk are identified. It is suggested that prototyping would reduce the technical risk as well as reduce the effects of the other three types of risk by allowing them to be quantified earlier. Prototype demonstration requirements addressed include electromagnetic power link feasibility demonstration, component integration verification, construction technology verification, and cost performance verification. Specific prototype requirements are listed and prototyping options are given in tabular form. E.A.K.

N82-22713*# Princeton Univ., N. J.
RECENT WORK ON USE OF LUNAR MATERIALS FOR SPS CONSTRUCTION
Gerard K. ONeill *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 223-226 refs Sponsored in part by the Space Studies Inst. (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The feasibility of mounting a small operation on the Moon to productively use lunar materials in support of programs such as the solar power satellite is addressed. A cost effective scenario of a small chemical process plant on the surface of the Moon and a small machine shop located in orbit is presented. The mass of the space installation is compared to the projected outputs in 90 days. It is indicated that the system would have the capability of replicating about 90% of its own components and would provide the metals, glasses, and silicon needed for the contruction of 90% to 96% of the mass of one solar power satellite per year. E.A.K.

N82-22714*# Center for Space Science, Fountain Valley, Calif.
A CONTRIBUTION TO THE AVAILABILITY OF LUNAR RESOURCES FOR POWERED CONSTRUCTION
T. A. Heppenheimer *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 227-230 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The use of lunar resources to construct solar power satellites wherein the resources are transported by a lunar mass driver is discussed. The minimization of cross track errors in the launch of payloads by mass driver is emphasized. The design and construction of the mass driver is outlined. Features of the proposed system addressed include passive magnetic damping, separation and snapout, and downrange correction. E.A.K.

N82-22715*# Rhode Island Univ., Kingston. Dept. of Electrical Engineering.
PASSIVE SOLAR REFLECTOR SATELLITE REVISITED
C. Polk and J. C. Daly *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 231-233 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Passive light weight reflectors in space which direct the incident solar energy to a specified location on the Earth surface are proposed as an alternative system for the solar power satellite to overcome conversion losses and to avoid the need for photovoltaic cells. On Earth, either photovoltaic cells or a steam turbine alternator on a solar tower, or a similar conventional, relatively high efficiency cycle are used for electricity generation. The constraints which apply to the design of the optical system if a single satellite is placed in geostationary orbit are outlined. A single lens and a two lens system are discussed. J.M.S.

N82-22716*# Power Conversion Technology, Inc., San Diego, Calif.
COMPARISON OF LOW EARTH ORBIT AND GEOSYNCHRONOUS EARTH ORBITS
J. E. Drummond *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 234-236 refs (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The technological, environmental, social, and political ramifications of low Earth orbits as compared to geosynchronous Earth orbits for the solar power satellite (SPS) are assessed. The capital cost of the transmitting facilities is dependent on the areas of the antenna and rectenna relative to the requirement of high efficiency power transmission. The salient features of a low orbit

Earth orbits are discussed in terms of cost reduction efforts.
E.A.K.

N82-22717*# Rockwell International Corp., Huntsville, Ala.
SATELLITE POWER SYSTEM TOTAL PROOF OF CONCEPT PROGRAM
William V. McRae, Jr. *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 240-242 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Requirements for a solar power satellite (SPS) orbital demonstration for providing a system proof of concept within the decade of the 1980s are outlined. Maximum use of the anticipated results of the ground based exploratory development program (GBED) results and Earth launching via the space shuttle are assumed. System demonstration requirements are listed. It was determined that total proof of concept can be demonstrated with a satellite at low Earth orbit, and that orbital construction of a full scale microwave antenna structure is feasible, as is demonstration of power collection by a transportable rectanna farm with an area of approximately one half acre. J.D.

N82-22718*# Rockwell International Corp., Downey, Calif.
GALLIUM ARSENIDE (GaAs) POWER CONVERSION CONCEPT
A. A. Nussberger *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 246-249 refs (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

A summary design analysis of a GaAs power conversion system for the solar power satellite (SPS) is presented. Eight different satellite configuration options for the solar arrays are compared. Solar cell annealing effects after proton irradiation are considered. Mass estimates for the SPS and the effect of solar cell parameters on SPS array design are discussed. J.D.

N82-22719*# Boeing Aerospace Co., Seattle, Wash.
SPS SILICON REFERENCE SYSTEM
Gordon R. Woodcock *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 250-253 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The design analysis of a silicon power conversion system for the solar power satellite (SPS) is summarized. The solar array, consisting of glass encapsulated 50 micrometer silicon solar cells, is described. The general scheme for power distribution to the array/antenna interface is described. Degradation by proton irradiation is considered. The interface between the solar array and the klystron equipped power transmitter is described. J.D.

N82-22720*# Boeing Aerospace Co., Seattle, Wash.
PROTON DAMAGE ANNEALING KINETICS IN SILICON SOLAR CELLS
W. E. Horne, I. Arimura, and A. C. Day *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 254-257 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Proton damage annealing as a method for prolonging the life of solar power systems in space is discussed. Variables are minimized and fundamental characteristics of proton damage annealing are considered. The usefulness of annealing for prolonging space missions is evaluated. A preliminary determination of optimum annealing conditions is made, and base data provided for more detailed research programs. J.D.

N82-22721*# Little (Arthur D.), Inc., Cambridge, Mass.
EVALUATION OF SOLAR CELL MATERIALS FOR A SOLAR POWER SATELLITE
Peter E. Glaser, David W. Almgren, and Katinka I. Csigi *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 263-266 refs (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Alternative solar cell materials being considered for the solar power satellite are described and price, production, and availability projections through the year 2000 are presented. The chief materials considered are silicon and gallium arsenide. J.D.

N82-22722*# Mathematical Sciences Northwest, Inc., Bellevue, Wash.
SOLAR DRIVEN LASERS FOR POWER SATELLITE APPLICATIONS
R. Taussio, P. Cassady, and E. Klosterman *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 267-270 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The technological feasibility of using multimagawatt lasers for space power transmission is discussed. Candidate lasers include electric discharge lasers, direct optically pumped lasers, and free electron lasers. J.D.

N82-22723*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
POWER TRANSMISSION AND RECEPTION. AN OVERVIEW AND PERSPECTIVE
R. H. Dietz *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 273-276 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Systems definition and assessment of the microwave power transmission and reception (PTAR) system for the solar power satellite are surveyed. Five different options are discussed and the separate antenna concept using the linear beam klystron to convert from dc to RF energy is described in detail. J.D.

N82-22724*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MICROWAVE SYSTEM PERFORMANCE SUMMARY
G. D. Arndt and E. J. Nalos (Boeing Co., Seattle) *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 277-280 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The design of the microwave system for the solar power satellite is described. Design modifications recommended include changes in phase control to the power module level, a reduction in allowable amplitude jitter, the use of metal matrix waveguides, and sequences for startup/shutdown procedures. Investigations into reshaping the beam pattern to improve overall rectenna collection efficiency and improve sidelobe control are surveyed.
J.D.

N82-22725*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SATELLITE POWER SYSTEM CONCEPT DEVELOPMENT AND EVALUATION PROGRAM, CRITICAL SUPPORTING INVESTIGATIONS. SUMMARY
J. w. Seyl *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 281-284 refs (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Investigations in critical technology of the solar power satellite (SPS) concept development program are summarized. Studies of the potential application of fiber optics transmission links across the SPS one kilometer antenna and evaluation of gallium arsenide field effect transistors and their associated power amplifier circuitry are discussed in more detail. J.D.

N82-22726*# LinCom Corp., Pasadena, Calif.
PHASE CONTROL SYSTEM CONCEPTS AND SIMULATIONS
V. C. Lindsay *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 285-288 refs (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

A phase control system concept for a solar power satellite is proposed which partitions the system into three major levels. The first level of phase control consists of a reference phase distribution system implemented in the form of phase distribution tree structure. The major purpose of the tree structure is to electronically compensate for the phase shift due to the transition path lengths from the center of the spacetenna to each phase control center located in each subarray. In the reference system, this is accomplished using the master slave returnable timing system technique. The second level of phase control consists of the beam steering and microwave power generating system which

houses the power transponders. This transponder consists of a set of phase conjugation multipliers driven by the reference phase distribution system output and the output of a pilot spread spectrum receiver which accepts the received pilot via a diplexer connected to a separate receive horn or the subarray itself. The output of the phase conjugation circuits serve as inputs to the third level of the phase control system. The third level of phase control is associated with maintaining an equal and constant phase shift through the microwave power amplifier devices while minimizing the associated phase noise effects on the generated power beam. This is accomplished by providing a phase locked loop around each high power amplifier. M.G.

N82-22727*# Novar Electronics Corp., Barberton, Ohio.
AN INTERFEROMETER BASED PHASE CONTROL SYSTEM
James H. Ott and James S. Rice *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 289-292 refs (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

An interferometer based phase control system for focusing and pointing the solar power satellite (SPS) power beam is discussed. The system is ground based and closed loop. One receiving antenna is required on Earth. A conventional uplink data channel transmits an 8 bit phase error correction back to the SPS for sequential calibration of each power module. Beam pointing resolution is better than 140 meters at the rectenna. Author

N82-22728*# Novar Electronics Corp., Barberton, Ohio.
A POWER SATELLITE SONIC SIMULATOR
James H. Ott and James S. Rice *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 293-296 refs (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

A simulator is described which generates and transmits a beam of audible sound energy mathematically similar to the solar power satellite (SPS) power beam. The simulator provides a laboratory means for analysis of ground based closed loop SPS phase control and of ionospheric effects on the SPS microwave power beam. Author

N82-22729*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SMALLER SPS SYSTEM SIZING TRADEOFFS
G. D. Arndt and L. Monford *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 297-300 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The solar power satellite and associated microwave system was reoptimized with larger antennas (at 2.45 GHz), reduced output powers, and smaller rectennas. Four constraints were considered: (1) the 23 mw/sq cm ionospheric limit; (2) a higher (54 mW/sq cm) ionospheric limit; (3) the 23 KW/sq cm thermal limit in the antenna; and (4) an improved thermal design allowing 33% additional waste heat. The differential costs in electricity for seven antenna/rectenna configurations operating at 2.45 GHz and five satellite systems operating at 5.8 GHz were calculated. It is concluded that a larger antenna/smaller rectenna configurations are economically feasible under certain conditions; a transmit antenna diameters should be limited to 1 to 1.5 Km for 2.45 GHz operation and .75 to 1.0 Km for 5.8 GHz; the present ionospheric limit of 23 mw/sq cm is probably too low and should be raised after ionospheric heating tests and studies are completed; the 5.8 GHz configurations are constrainted by antenna thermal limitations, rather than ionospheric limits; and multiple (two to four) antennas on a single solar satellite are recommended regardless of the particular antenna/rectenna configuration chosen. M.G.

N82-22730*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPS CONSTRUCTION PERSPECTIVE. SUMMARY
H. E. Benson *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 301-302 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Projections concerning the general construction requirements for a solar power satellite (SPS) are summarized. It is recognized that the ability to construct an SPS must be developed through an evolutionary process. This process would begin with shuttle operations and when construction timelines exceed the shuttle capability, small manned bases in low Earth orbit (LEO) would be used. The influence of construction methods on design, assembly bases, and crew considerations are addressed. M.G.

N82-22731*# Rockwell International Corp., Huntsville, Ala.
SPECIFIC CONSTRUCTION TESTS
William V. McRae, Jr. *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 307-309 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The technical feasibility of the Satellite Power System (SPS) is discussed. The development of feasible operational concepts and conceptualization of specific construction tasks are examined. The logic flow of functional analyses of both the rectenna and the satellite is illustrated. Constraints placed upon the construction processes and equipment by the satellite design are outlined. The construction tasks, when defined and combined into an integrated schedule establish, a time line for construction mass flow demands to be satisfied by the space transportation systems. An example of satellite constructive demands and HLLV delivery capabilities is given. E.A.K.

N82-22732*# Grumman Aerospace Corp., Bethpage, N.Y.
SPECIFIC SPS CONSTRUCTION STUDIES: CONSTRUCTION TASKS, CONSTRUCTION BASE
Ronald W. McCaffrey *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 310-315 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

A concept for building the 5000 MW reference solar power satellite in Earth orbit is discussed. The system uses silicon solar cells. The GEO base has contiguous facilities for concurrent assembly and subsequent mating of the satellite energy conversion system and its power transmission antenna. The end builder construction system uses 10 synchronized beam machines to automatically fabricate continuous longitudinal beams for the energy conversion system. E.A.K.

N82-22733*# Taylor (Thomas C.), Los Angeles, Calif.
CONSTRUCTION OF THE SPS PRIMARY STRUCTURE BY ANOTHER METHOD
Thomas C. Taylor *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 316-318 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The construction of the solar power satellite (SPS) primary structure using aluminum foam is discussed. The aluminum is salvaged from expended external tanks. The advantages of this construction system are: (1) saving in launch costs; (2) faster construction rates; (3) possible lower cost structures; (4) promotes containerless processing in orbit; (5) uses almost any space debris; and (6) frees the shuttle cargo bay for other uses. E.A.K.

N82-22734*# Boeing Aerospace Co., Seattle, Wash.
SPECIFIC SPS CONSTRUCTION STUDIES: OPERATIONS AND MAINTENANCE
Keith H. Miller *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 319-322 ref (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Surface as well as in-space operations of the solar power satellite program are addressed. The primary end products of SPS industrial enterprise are shown to be: (1) operation and maintenance of 20 satellites; completion (2) of a new SPS and its ground receiving antenna every six months; and (3) construction of electric cargo orbital transfer vehicles. The production of photovoltaic cells and solar blankets is also considered. E.A.K.

N82-22735*# Bechtel International Corp., San Francisco, Calif.
AUTOMATED CONSTRUCTION OF LIGHTWEIGHT, SIMPLE, FIELD-ERECTED STRUCTURES
R. S. Leonard *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 324-327 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The feasibility of automation of construction processes which could result in mobile construction robots is examined. The construction of a large photovoltaic power plant with a peak power output of 100 MW is demonstrated. The reasons to automate the construction process, a conventional construction scenario as the reference for evaluation, and a list of potential cost benefits using robots are presented. The technical feasibility of using robots to construct SPS ground stations is addressed. E.A.K.

N82-22736*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RECTENNA SYSTEM DESIGN
William C. Brown (Raytheon Co., Waltham, Mass.), R. M. Dickinson, E. J. Nalos (Boeing Aerospace Co.), and J. H. Ott (Nova Electronics Corp.) *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 328-331 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The function of the rectenna in the solar power satellite system is described and the basic design choices based on the desired microwave field concentration and ground clearance requirements are given. One important area of concern, from the EMI point of view, harmonic reradiation and scattering from the rectenna is also designed. An optimization of a rectenna system design to minimize costs was performed. The rectenna cost breakdown for a 56 w installation is given as an example. M.D.K.

N82-22737*# Novar Electronics Corp., Barberton, Ohio.
A THEORETICAL STUDY OF MICROWAVE BEAM ABSORPTION BY A RECTENNA
James H. Ott, James S. Rice, and Donald C. Thorn *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 332-335 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The rectenna's microwave power beam absorption limit was theoretically confirmed by two mathematical models descriptive of the microwave absorption process; first one model was based on the current sheet equivalency of a large planar array above a reflector and the second model, which was based on the properties of a waveguide with special imaging characteristics, quantified the electromagnetic modes (field configurations) in the immediate vicinity of a Rectenna element spacing which permit total power beam absorption by preventing unwanted modes from propagating (scattering) were derived using these models. Several factors causing unwanted scattering are discussed. M.D.K.

N82-22738*# Raytheon Co., Waltham, Mass.
POWER AMPLIFIERS (TUBE)
William C. Brown *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 336-339 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

An experimental model of the SPS transmitting antenna architecture was developed by combining a microwave oven magnetron with a ferrite circulator, a section of slotted waveguide radiator, and a control system to force the amplitude and the phase of the radiated output to follow phase and amplitude references. The amplitude control arrangement is depicted and evaluated. M.D.K.

N82-22739*# Rockwell International Corp., Anaheim, Calif.
SOLID-STATE CONFIGURATIONS
K. G. Schroeder *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 340-343 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Two prototype solid-state phased array systems concepts developed for the solar power satellite (SPS) are described. In both concepts, the beam was centered on the rectenna by means of phase conjugation of a pilot signal emanating from the ground. Also discussed are results of solid state studies. M.D.K.

N82-22740*# Rice Univ., Houston, Tex.
MICROWAVE POWER TRANSMISSION WORKSHOP SUMMARY
John W. Freeman *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 345-347 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The assumptions, methodologies, and conclusions of the NASA SPS studies were assessed and criticized to identify critical issues and to make recommendations for follow-on works. An assessment of the following items was made: beam forming and control, microwave amplifiers, radiating elements, and the rectenna. It was concluded that top priority should be given to determining an upper limit for permissible microwave power density which can be sent through the ionosphere. M.D.K.

N82-22741*# Rice Univ., Houston, Tex.
OFFSHORE RECTENNA FEASIBILTY
John W. Freeman, Don Hervey (Brown and Root Development, Inc.), and Peter Glaser (Arthur D. Little, Inc.) *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 348-351 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

A preliminary study of the feasibility and cost of an offshore rectenna to serve the upper metropolitan east coast was performed. A candidate site at which to build a 5 GW rectenna was selected on the basis of proximity to load centers, avoidance of shipping lanes, sea floor terrain, and relocated conditions. Several types of support structures were selected for study based initially on the reference system rectenna concept of a wire mesh ground screen and dipoles each with its own rectifier and filter circuits. Possible secondary uses of an offshore rectenna were examined and are evaluated. M.D.K.

N82-22742*# Massachusetts Inst. of Tech., Cambridge. Space Systems Lab.
HIGH-POWER MICROWAVE OPTICS FOR FLEXIBLE POWER TRANSMISSION SYSTEMS
K. Eric Drexler and B. Ray Sperber (Boeing Aerospace Co.) *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 352-355 refs (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

A large concave microwave mirror near the transmitter can magnify the apparent size of the Earth as seen from a phased array, and vice versa, permitting a small phased array to be coupled to a small rectenna while preserving the transmission efficiency (the reflection loss is slight) and peak power densities characteristic of the reference system. This augmentation of the phased array aperture with a large mirror gives the system greater resolution (in the optical sense), and opens new degrees of freedom in SPS design. The consequences of such an approach for a prototype satellite were explored. Its consequences for a mature SPS are discussed. N.W.

N82-22743*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ELECTRIC POWER PROCESSING, DISTRIBUTION, MANAGEMENT AND ENERGY STORAGE
Robert J. Giudici *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 359-363 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Power distribution subsystems are required for three elements of the SPS program: (1) orbiting satellite, (2) ground rectenna, and (3) Electric Orbiting Transfer Vehicle (EOTV). Power distribution subsystems receive electrical power from the energy conversion subsystem and provide the power busses rotary power transfer devices, switchgear, power processing, energy storage, and power management required to deliver control, high voltage plasma interactions, electric thruster interactions, and spacecraft charging of the SPS and the EOTV are also included as part of the power distribution subsystem design. N.W.

N82-22744*# Rockwell International Corp., Downey, Calif.
HIGH VOLTAGE SYSTEMS (TUBE-TYPE MICROWAVE)/ LOW VOLTAGE SYSTEM (SOLID-STATE MICROWAVE) POWER DISTRIBUTION

A. A. Nussberger and G. R. Woodcock (Boeing Aerospace Co., Seattle) *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 364-367 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

SPS satellite power distribution systems are described. The reference Satellite Power System (SPS) concept utilizes high-voltage klystrons to convert the onboard satellite power from dc to RF for transmission to the ground receiving station. The solar array generates this required high voltage and the power is delivered to the klystrons through a power distribution subsystem. An array switching of solar cell submodules is used to maintain bus voltage regulation. Individual klystron dc voltage conversion is performed by centralized converters. The on-board data processing system performs the necessary switching of submodules to maintain voltage regulation. Electrical power output from the solar panels is fed via switch gears into feeder buses and then into main distribution buses to the antenna. Power also is distributed to batteries so that critical functions can be provided through solar eclipses. N.W.

N82-22745*# IBM Federal Systems Div., Westlake Village, Calif.
SATELLITE POWER SYSTEM OPERATIONS
Francis L. Pugh and A. I. Gordon (Rockwell International, Seal Beach, Calif.) *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 368-371 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

A projection of the electrical energy demands over the next 30 to 50 years, coupled with reasonable assessments of known or developable energy sources, indicates that a shortage of electrical energy will occur about the turn of the century. Recognizing the criticality of such a shortage, the Department of Energy is currently evaluating alternative power generation concepts. One of these candidate concepts is the Satellite Power System. The power levels considered during the evaluation of the various satellite systems have ranged from 5 to 10 GW. It is apparent that, with this power level, both the satellite and the rectenna must be very large and encompass a large number of complex operational system activities. Major elements of the Satellite Power System (SPS) consist of a power satellite placed in a geosynchronous equatorial orbit, and a dedicated ground receiving station (GRS) located at a selected site within the continental United States. The nominal power output of the SPS is established at 5 gigawatts (5 million kilowatts) although, because of various system constraints or losses, it may actually produce between 4 and 5 gigawatts. N.W.

N82-22746*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
HIGH VOLTAGE SPACE PLASMA INTERACTIONS
J. E. McCoy *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 372-375 refs (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Two primary problems resulted from plasma interactions; one of concern to operations in geosynchronous orbit (GEO), the other in low orbits (LEO). The two problems are not the same. Spacecraft charging has become widely recognized as a problem, particularly for communications satellites operating in GEO. The very thin thermal plasmas at GEO are insufficient to bleed off voltage buildups due to higher energy charged particle radiation collected on outer surfaces. Resulting differential charging/discharging causes electrical transients, spurious command signals and possible direct overload damage. An extensive NASA/Air Force program has been underway for several years to address this problem. At lower altitudes, the denser plasmas of the plasmasphere/ionosphere provide sufficient thermal current to limit such charging to a few volts or less. Unfortunately, these thermal plasma currents which solve the GEO spacecraft charging problem can become large enough to cause just the opposite problem in LEO. N.W.

N82-22747*# United Technologies Corp., East Hartford, Conn.
MICROWAVE HEATING OF THE LOWER IONOSPHERE
Gerald Meltz and W. L. Nighan *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 403-406 ref (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Changes in the properties of the lower ionosphere due to ohmic heating of the plasma by the solar power satellite (SPS) microwave power beam are considered. The development of a predictive model of the underdense interaction of an electromagnetic beam and the lower ionosphere is described. The extent to which the Platteville and Arecibo experiments simulate SPS conditions is considered. J.D.

N82-22748*# Institute for Telecommunication Sciences, Boulder, Colo.
SUMMARY OF THE ELECTROMAGNETIC COMPATIBILITY EVALUATION OF THE PROPOSED SATELLITE POWER SYSTEM
Ernest L. Morrison, Jr., William B. Grant, and Karl C. Davis (Battelle Memorial Inst., Richland, Wash.) *In* NASA, Washington The Final Proc. of the Solar Satellite Program Rev. Jul. 1980 p 414-418 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The effects of the proposed solar power satellite (SPS) operations on electronic equipment and systems by fundamental, harmonic, and intermodulation component emissions from the orbital station; and the fundamental, harmonic, and structural intermodulation emissions from the rectenna site were evaluated. The coupling and affects interactions affecting a wide spectrum of electronic equipment are considered. The primary EMC tasking areas are each discussed separately. J.D.

N82-22749*# National Radio Astronomy Observatory, Socorro, N. Mex.
THE EFFECTS OF A SATELLITE POWER SYSTEM ON GROUND-BASED ASTRONOMY
A. R. Thompson *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 419-422 refs Sponsored in part by NSF (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The effects of power transmission from the solar power satellite and of radiation from the ground based rectennas on radio astronomy, radar astronomy, and optical astronomy are discussed. Interference sources, acceptable signal and noise levels, and conflicting site requirements for observatories and rectennas are considered. J.D.

N82-22750*# Electromagnetic Compatibility Analysis Center, Annapolis, Md.
THE EMC OF SATELLITE POWER SYSTEMS AND DoD C-E SYSTEMS
James H. Atkinson and Marvin D. Aasen (ITT Research Inst., Annapolis, Md.) *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 424-427 ref (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The solar power satellite (SPS) technical parameters that are needed to accurately assess the electromagnetic compatibility (EMC) between SPS systems and DoD communications-electronics (C-E) systems are identified and assessed. The type of electromagnetic interactions that could degrade the performance of C-E systems are described and the major military installations in the southwestern portions of CONUS where specially sensitive C-E systems are being used for combat training and evaluation are identified. Classes of C-E systems that are generally in the vicinity of these military installations are considered. The Technical parameters that govern the degree of compatibility of the SPS with these C-E systems, and some technical requirements that are necessary to ensure short-term and long-term EMC are identified. J.D.

N82-22751*# Little (Arthur D.), Inc., Cambridge, Mass.
ENCOUNTERS BETWEEN SPS POWER BEAMS AND SATELLITES IN LOWER ORBITS
Philip K. Chapman *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 428-430 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Interference between the solar power satellite (SPS) power beam and other satellites in lower orbits is described. Measures

which might be taken to reduce the frequency of beam/satellite encounters or to minimize the effects of the encounters are discussed. J.D.

N82-22752*# Institute for Telecommunication Sciences, Boulder, Colo.

THE EMC IMPACT OF SPS OPERATIONS ON LOW EARTH ORBIT SATELLITES

William B. Grant, Ernest L. Morrison, Jr., and Karl C. Davis (Battelle Memorial Inst., Richland, Wash.) *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 431-434 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The susceptibility of various operational and planned low Earth orbit satellites to solar power satellite (SPS) operations was examined. Functional degradation for the electronic systems on LANDSAT, the global positioning system, and the space telescope is described in relation to the amplitude of the SPS illumination components. Analyses include the modes of coupling to devices and subsystems, and performance effects in relation to satellite mission. M.G.

N82-22753*# Institute for Telecommunication Sciences, Boulder, Colo.

THE SPS INTERFERENCE PROBLEM-ELECTRONIC SYSTEM EFFECTS AND MITIGATION TECHNIQUES

John R. Juroshek *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 435-538 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The potential for interference between solar power satellites (SPS) and other Earth satellite operations was examined along with interference problems involving specific electronic devices. Conclusions indicate that interference is likely in the 2500 MHz to 2690 MHz direct broadcast satellite band adjacent to SPS. Estimates of the adjacent channel noise from SPS in this band are as high as -124 dBc/4 kHz and -100 dBc/MHz, where dBc represents decibels relative to the total power in the fundamental. A second potential problem is the 7350 MHz, 3d harmonic from SPS that falls within the 7300 MHz to 7450 MHz space to Earth, government, satellite assignment. Catastrophic failures can be produced in integrated circuits when the microwave power levels coupled into inputs and power leads reach 1 to 100 watts. The failures are typically due to bonding wire melting, metallization failures, and junction shorting. Nondestructive interaction or interference, however, generally occurs with coupled power levels of the order of 10 milliwatts. This integration is due to the rectification of microwave energy by the numerous pn junctions within these circuits. M.G.

N82-22754*# Argonne National Lab., Ill. Energy and Environmental Systems Div.

RECTENNA RELATED ATMOSPHERIC EFFECTS

J. Lee *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 440-443 refs (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Possible meteorological effects arising from the existence and operations of a solar power satellite (SPS) system rectenna are examined. Analysis and model simulations in some chosen site situations and meteorological conditions indicate that the meteorological effects of the construction and operation of a rectenna are small, particularly outside the boundary of the structure. From weather and climate points of view, installation of an SPS rectenna seems likely to have effects comparable with those due to other nonindustrial land use changes covering the same area. The absorption and scattering of microwave radiation in the troposphere would have negligible atmospheric effects. M.G.

N82-22755*# Argonne National Lab., Ill.

GROUND CLOUD AIR QUALITY EFFECTS

Kenneth L. Brubaker *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 444-445 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 01A

The effects of the ground cloud associated with launching of a large rocket on air quality are discussed. The ground cloud consists of the exhaust emitted by the rocket during the first 15 to 25 seconds following ignition and liftoff, together with a large quantity of entrained air, cooling water, dust and other debris. Immediately after formation, the ground cloud rises in the air due to the buoyant effect of its high thermal energy content. Eventually, at an altitude typically between 0.7 and 3 km, the cloud stabilizes and is carried along by the prevailing wind at that altitude. For the use of heavy lift launch vehicles small quantities of nitrogen oxides, primarily nitric oxide and nitrogen dioxide, are expected to be produced from a molecular nitrogen impurity in the fuel or liquid oxygen, or from entrainment and heating of ambient air in the hot rocket exhaust. In addition, possible impurities such as sulfur in the fuel would give rise to a corresponding amount of oxidation products such as sulfur dioxide. M.G.

N82-22756*# Argonne National Lab., Ill. Energy and Environmental Systems Div.

GROUND CLOUD RELATED WEATHER MODIFICATION EFFECTS

J. Lee *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 446-449 refs (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The principal concerns about inadvertent weather modification by the solar power satellite system rocket effluents are discussed, namely the possibility that the ground cloud might temporarily modify local weather and the cumulative effects of nearly 500 launches per year. These issues are discussed through the consideration of (1) the possible alteration of the microphysical processes of clouds in the general area due to rocket effluents and debris and cooling water entrained during the launch and (2) the direct dynamical and thermodynamical responses to the inputs of thermal energy and moisture from the rocket exhaust for given ambient meteorological conditions. The huge amount of thermal energy contained in the exhaust of the proposed launch vehicle would in some situations induce a saturated, wet convective cloud or enhance an existing convective activity. Nevertheless, the effects would be limited to the general area of the launch site. The observed long lasting high concentrations of cloud condensation nuclei produced during and after a rocket launch may appreciably affect the frequency of occurrence and persistence of fogs and haze. In view of the high mission frequency proposed for the vehicle launches, a potential exists for a cumulative effect. M.G.

N82-22757*# Argonne National Lab., Ill.

OVERVIEW OF HLLV EFFLUENTS IN STRATOSPHERE AND ABOVE

Kenneth L. Brubaker *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 450-451 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The injection of large quantities of rocket exhaust effluent into the upper atmosphere by the heavy lift launch vehicle (HLLV) of the solar power satellite system is discussed. The exhaust products considered are CO, CO2, H2O, H2, and NO. The effects on the composition of the atmosphere at different altitudes are estimated. J.D.

N82-22758*# Boston Coll., Chestnut Hill, Mass. Space Data Analysis Lab.

MESOSPHERIC CLOUD FORMATIONS

Jeffrey M. Forbes *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 452-453 refs (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Formation of mesospheric clouds as a result of deposition of large amounts of H2O by the heavy lift launch vehicle (HLLV) of the solar power satellite system is discussed. The conditions which must be met in order to form and maintain clouds near the mesopause are described. The frequency and magnitude of H2O injections from the HLLV rocket exhaust are considered. J.D.

N82-22759*# Boston Coll., Chestnut Hill, Mass. Space Data Analysis Lab.

D- AND E-REGION EFFECTS

Jeffrey M. Forbes *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 454-457 ref (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

A time dependent analytic formalism is utilized to examine the competing effects of transport, photodissociation, and frequency of injection on the steady state global distribution of heavy lift launch vehicle (HLLV) second stage discharges of H2O. The model is employed to estimate concomitant effects on the ion chemistries of the D and E regions of the atmosphere. J.D.

N82-22760*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ENVIRONMENTAL EFFECTS OF SPS: THE MIDDLE ATMOSPHERE
R. C. Whitten, W. J. Borucki, C. Park, H. T. Woodward, R. P. Turco (R and D Associates, Marina Del Ray, Calif.), S. S. Prasad (JPL, Pasadena, Calif.), L. A. Capone (San Jose State Univ., Calif.), and C. A. Riegel (San Jose State Univ., Calif.) *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 458-459 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The heavy lift launch vehicle associated with the solar power satellite (SPS) would deposit in the upper atmosphere exhaust and reentry products which could modify the composition of the stratosphere, mesosphere, and lower ionosphere. In order to assess such effects, atmospheric model simulations were performed, especially considering a geographic zone centered at the launch and reentry latitudes. J.D.

N82-22761*# California Inst. of Tech., Pasadena. Bioinformation Systems.
SUNLIGHT REFLECTIONS FROM A SOLAR POWER SATELLITE ON SOLAR MIRRORS SHOULD NOT HARM THE EYES
Michael T. Hyson *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 460-463 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The potential hazard imposed by the reflection of the Sun's image by the solar power satellite (SPS) was examined. In the worst case, where the transmitter is assumed to be a perfect mirror reflecting the Sun's image normal to the atmosphere, the total energy received by the eye would be 3.36 x 10 to the -7th power watts. The eye's optics would blur the 5.6 sec of art image of the transmitter over a disk approximately 6 minutes arc in diameter, reducing the maximum intensity at the retina by 99%. A given cone in the retina would receive even less energy due to the constant random microtremors and microsaccadic movements of the eye muscles which move the retina over an area some 8 minutes of arc in radius, even during steady fixation. Therefore, very conservative estimates show that the reflections from the transmitter could be viewed safety for at least 3.2 hours and that the entire SPS structure could be viewed for a minimum of 1 hour. The solares mirror is briefly considered and is shown to be safe to view for at least 2.4 minutes. M.G.

N82-22762*# Boeing Aerospace Co., Seattle, Wash.
CHARACTERIZATION OF REFLECTED LIGHT FROM THE SPACE POWER SYSTEM
Harold B. Liemohn, D. L. Tingey, Richard H. Holze, and B. R. Sperber *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 464-468 refs (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Sunlight reflected off large space structures is examined. To assure that this illumination does not exceed the irradiance tolerances of the eye, reflections from these satellites must be controlled by vehicle orientation and surface specifications. The components of various space power system vehicles to determine the reflectances which will significantly contribute to the ground illumination are evaluated. Calculations of reflected solar intensity from various satellite system elements requires description of the elements and of the geometry potential reflectance paths. Surface intensity and the conditions under which it will illuminate a portion of the Earth are also determined. E.A.K.

N82-22763*# Environmental Resources Group, Los Angeles, Calif.
PROTOTYPE ENVIRONMENTAL ASSESSMENT OF THE IMPACTS OF SITING AND CONSTRUCTION OF AN SPS GROUND RECEIVING STATION
John Hill *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 469-472 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

A prototype assessment of the environmental impacts of siting and constructing a Satellite Power System (SPS) Ground Receiving Station (GRS) is reported. The objectives of the study were: (1) to develop an assessment of the nonmicrowave related impacts of the reference system SPS GRS on the natural environment; (2) to assess the impacts of GRS construction and operations in the context of actual baseline data for a site in the California desert; and (3) to identify critical GRS characteristics or parameters that are most significant in terms of the natural environment. M.D.K.

N82-22764*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EFFECTS OF THE SPACE ENVIRONMENT ON THE HEALTH AND SAFETY OF SPACE WORKERS
Wayland E. Hull *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 473-474 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Large numbers of individuals are required to work in space to assemble and operate a Solar Power Satellite. The physiological and behavioral consequences for large groups of men and women who perform complex tasks in the vehicular or extravehicular environments over long periods of orbital stay time were considered. The most disturbing consequences of exposure to the null gravity environment found relate to: (1) a generalized cardiovascular deconditioning along with loss of a significant amount of body fluid volume; (2) loss of bone minerals and muscle mass; and (3) degraded performance of neutral mechanisms which govern equilibrium and spatial orientation. M.D.K.

N82-22765*# California Univ., Berkeley. Lawrence Berkeley Lab. Biology and Medicine Div.
HAZARDS TO SPACE WORKERS FROM IONIZING RADIATION
John T. Lyman *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 475-476 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

A compilation of background information and a preliminary assessment of the potential risks to workers from the ionizing radiation encountered in space is provided. The report: (1) summarizes the current knowledge of the space radiation environment to which space workers will be exposed; (2) reviews the biological effects of ionizing radiation considered of major importance to a SPS project; and (3) discusses the health implications of exposure of populations of space workers to the radiations likely to penetrate through the shielding provided by the SPS work stations and habitat shelters of the SPS Reference System. Author

N82-22766*# California Univ., Berkeley. Lawrence Berkeley Lab. Donner Lab.
LATE BIOLOGICAL EFFECTS OF HEAVY CHARGED PARTICLES: CATARACTS, VASCULAR INJURY AND LIFE SHORTENING IN MICE
E. J. Ainsworth, J. G. Jose, M. E. Barker, and E. L. Alpen *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 477-479 (For primary document see N82-22676 13-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Risks associated with extended habitation in a space environment, particularly hazards to space workers that might result from exposure to high energy heavy ion particles (HZE), were studied. Biological effects of HZE were investigated in mice to assess their potential adverse health hazards. The potential effects of HZE particles on the crystalline lens of the eye and the carcinogenic effects and blood vessel (vascular) damage from radiation were evaluated by a risk assessment. Animal experiments

to evaluate dose response relationships for tumor induction/promotion and for vascular injury were introduced. Cataract productions and preliminary results on cacinogenic and vascular effects are presented for perspective. M.D.K.

N82-22767*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

EFFECTS OF ARGON ION INJECTIONS IN THE PLASMASPHERE

Steven A. Curtis and J. M. Grebowsky *In* NASA, Washington The Final Proc. of the Solar Power Satellite Program Rev. Jul. 1980 p 501-504 refs (For primary document see N82-22676 13-44)

Avail: NTIS HC A99/MF A01 CSCL 10A

In lifting massive space power system payloads from low Earth orbit to geosynchronous Earth orbit, Cargo Orbit Transfer (COTV) using ion propulsion will inject energetic beams of argon ions into the plasmasphere. The relationship of the beam velocity to Alfven and thermal velocities as a function of radial distance in the plasmasphere is given for positions near the Earth's equatorial plane. A beam sheath loss model is used which results in a deposition of argon ions and hence energy in the plasmasphere which is much less than that in models calling for clouds or plasma instabilities to rapidly stop the beam. A comparison is given of the cumulative fractional mass loss of an ion beam injected at 1.5 R for the ion cloud and the ion beam sheath loss process. The integrated difference of these two deposition models is shown for the construction of one SPS. M.D.K.

N82-22768*# Boston Univ., Mass.

PROCEEDINGS OF THE WORKSHOP/SYMPOSIUM ON THE PRELIMINARY EVALUATION OF THE IONOSPHERIC DISTURBANCES ASSOCIATED WITH THE HEAO-C LAUNCH, WITH APPLICATIONS TO THE SPS ENVIRONMENTAL ASSESSMENT

M. Mendillo, ed. and B. Baumgardner, ed. Aug. 1980 260 p refs Workshop held in Boston, 11-13 Nov. 1980 Sponsored by NASA

(Contract W-31-109-eng-38)

(NASA-CR-168839; NAS 1.26:168839; CONF-7911108) Avail: NTIS HC A12/MF A01 CSCL 10A

Satellite radio beacon studies of the ionosphere's total electron content (TEC), using geostationary satellite radio beacons and low-earth orbit beacons are summarized. Airglow studies using airborne and ground-based facilities are discussed and incoherent scatter radar studies are reviewed. The HEAO-Hole followed the rocket's ground track, extending at least 2000 km to the east of Cape Canaveral. Its north-south extent spanned 600 to 1000 km and thus the overall disturbed region totalled 1 to 3 million square kilometers in effective surface area. While the geographical location of the depletion centered on the rocket's trajectory for approximately 3 hours, subsequent evidence suggested a northward displacement. Airglow measurements and satellite beacon data showed that during the first hour of the event the depletion was not symmetrical in latitude, in that the southern edge was steeper than the northern edge. Several observers noted short-term (tens of seconds to tens of minutes) fades or increased fading rates in the 7 to 21 MHz range that occurred at times consistent with a rocket-associated effect. N.W.

N82-22769# Department of Energy, Washington, D. C. Office of Environmental Assessments.

COAL-FIRED POWER PLANT (WESTERN COAL): ENVIRONMENTAL CHARACTERIZATION INFORMATION REPORT

Jan. 1981 67 p refs Prepared in cooperation with Aerospace Corp., Germantown, Md.

(Contract DE-A703-76EV-74010)

(DOE/EP-0019) Avail: NTIS HC A04/MF A01

The latest available environmental and technical information on coal-fired power plants was collected from a number of sources. The typical plant chosen for characterization was a 500/MWe pulverized-coal plant burning western low-sulfur coal. The plant uses an electrostatic precipitator, a lime/limestone scrubber, and a wet, mechanical draft cooling tower. The plant fuel is supplied from offsite mines by unit-train deliveries with surface mined, thick seam coal, which undergoes minimum preparation prior to pulverization. The process, plant operating parameters, resources needed, and environmental residuals and products associated with the power plant are presented. Annual resource usage and pollutant discharges are given, assuming an annual plant capacity factor of 80 percent. Quantities are given in terms of ten to the twelth power Btu's of electric energy produced. Several plants are discussed individually. Environmental regulations are discussed. The overall physical requirements of the plant for land and water are discussed. R.J.F.

N82-22770*# DHR, Inc., Washington, D.C.

MARKET ASSESSMENT OF PHOTOVOLTAIC POWER SYSTEMS FOR AGRICULTURAL APPLICATIONS IN COLOMBIA Final Report

William Steigelmann and Sergio Neyeloff Nov. 1981 124 p refs Presented in cooperation with Associates in Rural Development, Inc., Burlington, Vt.

(Contracts DEN3-180; DE-AI01-79ET-20485)

(NASA-CR-165524; DOE/NASA-0180/5) Avail: NTIS HC A06/MF A01 CSCL 10B

The market potential for photovoltaic systems in the agricultural sector of Colombia is assessed. Consideration was given to over twenty specific livestock production, crop production, and rural services applications requiring less than 15 kW of power without backup power. Analysis revealed that near-term potential exists for photovoltaic technology in applications in coffee depulging, cattle watering, rural domestic users, rural water supply and small irrigation, rural telephones, rural health posts, and vaccine refrigeration. Market size would be in the 1200 to 2500 kWp range in the 1981 to 86 timeframe. Positive factors influencing the market size include a lack of electrical services, potential for developing the Llanos Orientales Territory, high fuel costs in remote areas, balance of system availability, the presence of wealthy land owners, and a large government-sponsored contract for photovoltaic (PV)-powered rural telephone systems. The enticipated eligibility of photovoltaic equipment for loans would be a further positive factor in market potential. Important negative factors include relatively inexpensive energy in developed locations, reliance on hydropower, lack of familiarity with PV equipment, a lack of financing, and established foreign competition in PV technology. Recommendations to American PV manufacturers attempting to develop the Colombian market are given. R.J.F.

N82-22771# National Building Research Inst., Pretoria (South Africa).

ENERGY CONSERVATION IN HOUSES. A TECHNICAL PRESS DAY REPORT ON THE RESULTS OF THE LOW ENERGY EXPERIMENTAL HOUSE PROJECT IN GARSFONTEIN, PRETORIA

7 Jul. 1981 14 p refs

Avail: NTIS HC A02/MF A01

The low energy experimental house project demonstrated that a home constructed from traditional materials, by traditional methods, maintains an acceptable indoor thermal environment with low levels of energy utilization, and evaluated the long term cost benefits of different energy saving options. Both the experimental and the demonstration aspects necessitated the use of full scale houses. Two such houses were built in Pretoria, one of which was to serve as a control. They were both typical well designed middle income homes, but the low energy house embodied a number of energy saving design features as well as an air based space and water heating solar system. The floor plans of both houses were similar and that of the low energy house is presented. S.L.

N82-22772# Joint Economic Committee (U. S. Congress).

A NATIONAL INDEX FOR ENERGY PRODUCTIVITY

Alton Penz and Dennis Bakke Washington GPO 1981 46 p refs Rept. presented to the Joint Econ. Comm., 97th Congr., 1st Sess., 13 May 1981 Prepared by Mellon Inst., Arlington, Va.

(GPO-75-886) Avail: SOD HC

Possible indices to measure changes in energy productivity are explored. These indices could provide the nation with better information about how it uses energy. It is recommended that certain uses of these indices be adopted and widely disseminated by government. The widespread use of an energy productivity index by the government and in the media could provide many

significant benefits: (1) it signals the importance that government attaches to increasing energy efficiency; (2) it focuses and sustains national attention on this critical energy strategy; (3) an energy productivity index motivates and challenges the nation; (4) it serves as an early warning system that current approaches are not working and new approaches are called for; (5) it is a useful tool for public planners and policy makers in predicting future energy productivity trends; and (6) energy productivity indices increase the publics understanding of energy services. It is concluded that the adoption of a systematic dissemination of the indices will enhance public understanding of energy productivity and contribute to maximizing energy efficiency. E.A.K.

N82-22773# Sargent and Lundy, Engineers, Chicago, Ill.
COMPRESSED-AIR ENERGY STORAGE: PRELIMINARY DESIGN AND SITE DEVELOPMENT PROGRAM IN AN AQUIFER. VOLUME 3B: SITE SELECTION STUDY, PART 2 Final Report
W. C. Walke 31 Jul. 1981 24 p refs Sponsod by EPRI Prepared in cooperation with Public Service Co. of Indiana, Inc.
(Contracts DE-AC02-78ET-29232; ET-78-C-01-2159; EPRI Proj. RP-1081-3)
(DE82-000674; DOE/ET-29232-T4/Vol-3B) Avail: NTIS HC A02/MF A01

Fourteen sites considered to have potential for development with a 1000 MW compressed air energy storage (CAES) plant were identified by the Illinois State Geological Survey (ISGS) and the Indiana Geological Survey (IGS). The relative desirability of developing each of these sites was evaluated from the standpoints of geology, economics, air quality/meteorology, cultural resources, and ecology. Preliminary site layouts were developed for each of the 14 sites. Sites that were found to be incapable of supporting a 1000 MW plat, or that would require more than 2000 air injection-withdrawal wells to do so, were eliminated from consideration. The seven remaining top-ranked sites were then selected for further study. T.M.

N82-22774# Sargent and Lundy, Engineers, Chicago, Ill.
COMPRESSED-AIR ENERGY STORAGE: PRELIMINARY DESIGN AND SITE DEVELOPMENT PROGRAM IN AN AQUIFER. AQUIFER GEOLOGY, VOLUME 4 Final Report
W. C. Walke 31 Jul. 1981 191 p refs Sponsored by EPRI Prepared in cooperation with Public Service Co. of Indiana, Inc.
(Contracts DE-AC02-78ET-29232; ET-78-C-01-2159; EPRI Proj. RP-1081-3)
(DE82-000673; DOE/ET-29232-T4-Vol-4) Avail: NTIS HC A09/MF A01

The behavior and suitability of aquifers as compressed air energy storage sites are investigated. The geological structure of the study area; a literature review of potential areas of concern which could affect operation of a compressed air energy storage plant, aquifer testing, media site geological conditions, and areas of potential risk from air storage in an aquifer are discussed. DOE

N82-22775# Center for the Environment and Man, Inc., Hartford, Conn.
SOLAR POWERED DESICCANT AIR CONDITIONING SYSTEM Final Report
24 Jul. 1981 27 p refs
(Contracts DE-AC02-76CS-52702; DE-AC02-77CS-34286; E(11-1)-2702; E(11-1)-4286)
(DE82-002656; DOE/CS-52702/T1; DOE/CS-34286) Avail: NTIS HC A03/MF A01

A solar-powered desiccant air conditioning system using silica gel was developed, and modifications to the existing unit and additional testing are proposed to demonstrate the feasibility of the unit. Conversion from a rotating bed to a fixed bed of silica gel is proposed. Some general plans for commercialization are briefly discussed. DOE

N82-22776# Porter (W. H.), Inc., Holland, Mich. Port-R-Span Div.
PASSIVE AND HYBRID SOLAR MANUFACTURED HOUSING AND BUILDINGS. PHASE 1: TECHNICAL PROPOSAL Final Report
K. F. Osika 1 Aug. 1981 49 p
(Contract DE-FC02-80CS-30388)
(DE82-002098; DOE/CS-30388/1) Avail: NTIS HC A03/MF A01

The design objective for manufacturing farrowing-nursery building for hog confinement which uses a minimal amount of winter heat and is relatively cool in summer is discussed. Savings are to be accomplished by using an air to air heat exchanger, a hot air collector, and a wood stove in place of backup bottle gas. Solar alternatives and design criteria are described. A thermal analysis was performed. DOE

N82-22777# Boeing Engineering and Construction, Seattle, Wash.
SECOND-GENERATION HELIOSTAT DEVELOPMENT FOR SOLAR-CENTRAL RECEIVERS Final Report
31 Mar. 1981 193 p Prepared for Sandia National Labs., Livermore, Calif.
(Contract DE-AC04-76DP-00789)
(DE82-001844; SAND-81-8175-Vol-1) Avail: NTIS HC A09/MF A01

A production heliostat for a 50 MW/sub e/ solar electric power plant is described. The detail design, along with trades, analyses, and testing in support of the design are presented. The collector subsystem's performance is assessed. Fabrication, checkout, and installation of two prototypes are described. DOE

N82-22778# Boeing Engineering and Construction, Seattle, Wash.
SECOND-GENERATION HELIOSTAT DEVELOPMENT FOR SOLAR-CENTRAL RECEIVERS, DETAIL DESIGN REPORT. VOLUME 1, APPENDIX Final Report
31 Mar. 1981 205 p Prepared for Sandia National Labs., Livermore, Calif.
(Contract DE-AC04-76DP-00789)
(DE82-001842; SAND-81-8175-Vol-1-App-1) Avail: NTIS HC A10/MF A01

Details of design, analysis, and test of the heliostats are provided. The azimuth drive, bearing assembly, assembled gimbal, actuator drive assembly, reflectors, and control system are described. DOE

N82-22779# Boeing Engineering and Construction, Seattle, Wash.
SECOND-GENERATION HELIOSTAT DEVELOPMENT FOR SOLAR-CENTRAL RECEIVERS: VOLUME 1, DETAIL DESIGN REPORT. APPENDIX 2 Final Report, 24 Jul. - 24 Oct. 1980
Winsmith (Ford Aerospace and Communications Corp.) et al 31 Mar. 1981 392 p Prepared for Sandia National Labs., Livermore, Calif.
(Contract DE-AC04-76DP-00789)
(DE82-001843; SAND-81-8175-Vol-1-App-2) Avail: NTIS HC A17/MF A01

Three different types of rotary drive and bearing assemblies are investigated. These drives are designed and sized to meet load and life requirements for an azimuth actuation system for a second generation heliostat program. A structural analysis of the actuator is included. Two other actuator types are briefly examined although they are sized to meet applicable load life specifications. The actuator design considered the most suitable for the applications consists of a small worm gear drive as the first reduction stage and of a differential planetary as the final reduction. DOE

N82-22780# Ford Motor Co., Dearborn, Mich.
SECOND-GENERATION HELIOSTAT DEVELOPMENT FOR SOLAR-CENTRAL CENTRAL RECEIVERS. DETAIL DESIGN REPORT: VOLUME 2, APPENDICES I, J Final Report
31 Mar. 1981 499 p Prepared for Boeing Engineering and Construction Prepared in cooperation with Ford Aerospace and Communications Corp.
(Contract DE-AC04-76DP-00789)
(DE82-001837; SAND-81-8175-Vol-2-App-I and J) Avail: NTIS HC A21/MF A01

A heliostat manufacturing study consisting of evaluations of variable cost and investment costs, program engineering, training, preactivation and launching, savings opportunities, and selling price is presented. Descriptions of the facilities and manufacturing plan are included. General support departments and systems

and other backup data are included as well as detailed cost and process description data for the heliostat facet assembly.
DOE

N82-22781# Rocket Research Corp., Redmond, Wash.
UTILIZATION OF WASTE HEAT FROM MAJOR TRANSFORMER SUBSTATIONS. VOLUME 3: APPENDIX Final Report
Noel T. Christensen, Keneth W. Arasim, Charles R. Roberts, Gerald V. Gibney, and Wayne Price Aug. 1981 152 p refs Sponsored by EPRI Prepared in cooperation with Seattle City Light and Henningson, Durham and Richardson, P.S.
(EPRI Proj. 1274-1)
(DE82-900357; EPRI-EM-1968-Vol-3) Avail: NTIS HC A08/MF A01

Large substation transformers reject substantial thermal energy. Since these units are usually close-coupled to facilities requiring low-temperature thermal energy for space conditioning, the ability to recover and efficiently utilize this energy is of significant interest. A general system was designed and optimized for the recovery of transformer waste heat. Simplified analytical techniques were developed to assist utilities in both preliminary analysis and detail design analysis of specific systems, including system economics. Critical component performance parameters were identified for the preparation of detailed specifications. Criteria for the specific application of such systems through system economics are presented. T.M.

N82-22782# Idaho National Engineering Lab., Idaho Falls.
GEOTHERMAL SOURCE POTENTIAL AND UTILIZATION FOR ALCOHOL PRODUCTION
J. C. Austin Nov. 1981 71 p
(Contract DE-AC07-76ID-01570)
(DE82-003801; EGG-2138) Avail: NTIS HC A04/MF A01

A study was conducted to assess the technical and economic feasibility of using a potential geothermal source to drive a fuel grade alcohol plant. Test data from the well at the site indicated that the water temperature at approximately 8500 feet should approach 2750 F. However, no flow data was available, and so the volume of hot water that can be expected from a well at this site is unknown. Using the available data, numerous fuel alcohol production processes and various heat utilization schemes were investigated to determine the most cost effective system for using the geothermal resource. The study found the direct application of hot water for alcohol production based on atmospheric processes using low pressure steam to be most cost effective. It was determined that a 3 million gpy alcohol plant is the largest facility that can practically be powered by the flow from one large geothermal well. DOE

N82-22783# Idaho National Engineering Lab., Idaho Falls.
POTENTIAL GEOTHERMAL ENERGY APPLICATIONS FOR IDAHO ELKS REHABILITATION HOSPITAL
J. C. Austin Nov. 1981 14 p
(Contract DE-AC07-76ID-01570)
(DE82-003803; EGG-2139) Avail: NTIS HC A02/MF A01

Several potential applications of geothermal energy for the Idaho Elks Rehabilitation Hospital are outlined. A brief background on the resource and distribution system, is provided; which hospital heating systems should be considered for potential geothermal retrofit is discussed; and technical and economic feasibility are addressed. DOE

N82-22784# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
SPACE AND ENERGY: GLOBAL VIEWPOINT
Dietrich E. Koelle 1981 13 p refs Presented at 1st Intern. Aerospace Symp., Le Bourget, 2-3 Jun. 1981; sponsored by AIAA/Aerosalon
(MBB-UR-489-81-O) Avail: NTIS HC A02/MF A01

The potential contributions from space technology to solving the future world energy problem are addressed. The basic problem is created by the depletion of the fossile fuels in the next century. The replacement of oil, gas and coal is only feasible by nuclear power and solar energy. In the first case space technology can contribute to making the terrestrial storage of radioactive waste much less dangerous and more acceptable by expediting the highly radioactive components (only 3%) into space. In the case of solar energy space technology can contribute large solar power stations in space, providing energy via microwaves to special rectenna sites. J.M.S.

N82-22785# Klöeckner und Co. Waermetechnik, Hechingen (West Germany).
DEVELOPMENT OF CONTROL SYSTEMS FOR SOLAR WATER AND SOLAR SPACE HEATING EQUIPMENT. CHOICE OF HEAT CONDUCTING FLUID. TESTING Final Report, Apr. 1980
Hermann Meyer Bonn Bundesministerium fuer Forschung und Technologie Nov. 1981 81 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-185; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17,20

Flat plate collector systems suitable for hot water supply, swimming pool heating, and auxiliary space heating were developed. A control and ready made packaged pipe assembly, adapted to synthetic fluid, was developed. A heat transfer fluid was selected, pumps, safety devices, armatures and seals were tested for their long term performance. External heat exchangers for simple and cascade arrangement of the hot water tanks were tested. It is found that the channel design of a roll bonded absorber has only limited effect on collector performance if the channel width approximates the space between the plates. Systems already installed work satisfactorily. Author (ESA)

N82-22786# Fondazione Ugo Bordoni, Rome (Italy).
SOLAR RADIATION CHARACTERISTICS AND PREDICTION METHODS [CARATTERISTICHE METODI DI PREVISIONE DELLA RADIAZIONE SOLARE]
Francesco Barbaliscia Jun. 1981 52 p refs In ITALIAN Sponsored by Ente Nazionale per l'Energia Eletricca
(FUB-7-1981) Avail: NTIS HC A04/MF A01

Mathematical and statistical studies were carried out in order to provide a ground level solar radiation estimation, starting from meteorological data for given locations. Available insolation and meteorological historical series of Italian localities were used. Solar energy averaged over 24 hr periods is predictable with acceptable accuracy and, in certain cases, hourly energy distribution data can be obtained with an accuracy level sufficient for passive solar energy system design. For large active solar energy systems, further studies and detailed measurements are required. Author (ESA)

N82-22787# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Technische Physik.
THE DEVELOPMENT UP TO THE PRODUCTION STAGE OF DYNAMIC LATENT HEAT STORAGE USING GLAUBER'S SALT Final Report
Friedrich Lindner and Kurt Scheunemann (Fa.A. Schneider) Aug. 1981 98 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-81-32) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 19,35

The experience gained while developing small latent heat storage units, using Gauber's salt, from the operational tests of direct heat exchange up to the stage of production of 2000 l modules is described. Static and dynamic heat storage are compared and the principles of latent heat storage are reviewed. Optimization of the supply systems, internal overflow, stability of cycles, self-nucleus formation, and integration of the heat exchanger are treated. The advantages of Glauber's salt compared to other possible substances are pointed out: a heat capacity of about 576MJ, a heat exchange capability of 18MJ/hr and a maximum heat loss of 360kJ/hr at 10C outside temperature. Cycle and material tests demonstrate operational possibilities.
Author (ESA)

N82-22788# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Kernphysik.
TEST STATION FOR SOLAR COLLECTORS IN BRAZIL Final Report, Feb. 1981
Joergdieter Anhalt, Klaus Massmeyer, and Hans Joachim Stein Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 77 p refs In GERMAN; ENGLISH summary Sponsored

by Bundesministerium fuer Forschung und Technologie Original contains color illustrations
(BMFT-FB-T-81-224; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15,26

A test facility for solar collector systems, operating in the temperature range above 100 C, was developed. Research and development programs for the utilization of solar energy are discussed. Conversion efficiency and heat loss measurements relative to experimental collectors under operational climatic conditions are presented. Meteorological data acquisition and measurement data processing are explained. Availability of the facility for further studies is summarized, including methodology for choice and construction of solar energy system components. Author (ESA)

N82-22789# Institut fuer Kemtechnik und Energiewandlung e.V., Stuttgart (West Germany).
LATENT HEAT THERMAL ENERGY STORAGE: DETERMINATION OF PROPERTIES OF STORAGE MEDIA AND DEVELOPMENT OF A NEW TRANSFER SYSTEM Final Report, Jun. 1980
Ashok Abhat, Saad Aboul-Enein, and Nikolaus A. Malatidis Bonn Bundesministerium fuer Forschung und Technologie Jan. 1982 193 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-016; ISSN-0340-7608) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 34,80

A latent heat storage system for low temperature solar heating applications was developed. Latent heat storage materials were studied and a heat exchanger design was evaluated. Thermophysical properties of 14 organic and inorganic heat storage materials, including 5 inexpensive commercial paraffins, 2 fatty acids, and 5 salt hydrates, were measured with a precision differential scanning calorimeter. Data pertaining to phase transition temperature, enthalphy and, specific heat of the heat storage materials in solid and liquid phases were taken. The influence of thermal cycling on the melting and freezing behavior of the materials and on changes in thermophysical properties was analyzed. A heat exchanger with finned annulus heat exchanger elements was investigated. Tests were performed, using two laboratory models that employed a paraffin, two fatty acids and one salt hydrate as heat storage materials. Author (ESA)

N82-22790# General Energy Associates, Cherry Hill, N.J.
NEW YORK STATE INDUSTRIAL ENERGY PROFILE, VOLUME 1 Final Report
Bernard B. Hamel and Barry L. Brown Apr. 1981 250 p
(PB82-126848; Rept-49/EU-IUU/79-1-Vol-1; NYSERDA-81-9-1-Vol-1) Avail: NTIS HC A11/MF A01 CSCL 10A

A New York State industrial energy data base compatible with the national data base which includes industrial energy use on a national level and energy recovery technologies was studied. The data base is a comprehensive New York industrial energy use profile by county and 4 digit standard industrial classification (SIC) and includes the following process and waste energy fuel type, plant size, and employee distribution. Total energy consumption in the manufacturing sector in New York State. GRA

N82-22791# California Energy Commission, Sacramento.
ELECTRICITY TOMMORROW Final Report
Jan. 1981 490 p
(PB82-124165; CAEC-81) Avail: NTIS HC A21/MF A01 CSCL 10A

The critical issues for the electricity sector in California were presented. Adopted level of electricity demand and adopted policies and supply criteria are included. These form the basis for planning and certification of electric generation and transmission facilities by the energy commission. Estimates of the potential contributions of conservation and various conventional and alternative supply sources, critiques of utility supply plans, and determinations of how much new capacity is required are also included. Policy recommendations for directing public and private investments into preferred energy options, for spreading the benefits and costs of these options broadly and fairly among California's citizens, and for removing remaining obstacles to the development of all acceptable energy sources are presented. GRA

N82-22792# Minnesota Energy Agency, St. Paul.
THE POTENTIAL FOR UTILITY CONSERVATION INVESTMENTS IN MINNESOTA
Jan. 1981 285 p
(PB82-122219; MEA-1-81) Avail: NTIS HC A13/MF A01 CSCL 10A

The need for utility investments in conservation is analyzed. A framework for carrying out such an analysis, and goals for a conservation program are developed. Issues which stand in the way of achieving those goals are examined. The desirability of alternative utility conservation strategies is assessed. Policy recommendations are made for the Minnesota public utilities commission to consider in establishing a utility conservation investment pilot program. GRA

N82-22793# National Materials Advisory Board, Washington, D. C. Commission on Sociotechnical Systems.
AN ASSESSMENT OF THE INDUSTRIAL ENERGY CONSERVATION PROGRAM. VOLUME 1: SUMMARY Final Report, Nov. 1980 - Jul. 1981
Sep. 1981 50 p refs
(Contract DE-AC01-80CS-40298)
(PB82-122755; NMAB-395-1) Avail: NTIS HC A03/MF A01 CSCL 10A

Findings and recommendations of the industrial energy conservation program are summarized. Industrial operations in the U.S. consume some 37% of the country's total energy. This percentage will increase to 50% by 1980 unless appropriate conservation measures are applied. Conservation measures are difficult to implement. It is concluded that improvements for conservation are needed in the areas of: project selection, project management, and transfer of results to industry. GRA

N82-22581*# Alaska Dept. of Natural Resources, Anchorage.
THE ALASKA EXPERIENCE
Douglas L. Mutter *In* NASA. Ames Research Center Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 179-185 ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 05B

N82-23121*# Le Tourneau Coll., Longview, Tex.
ORBITER FUEL CELL IMPROVEMENT ASSESSMENT
Richard E. Johnson *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 27 p refs (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 10A

N82-23149# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
A POINT FOCUSING COLLECTOR FOR AN INTEGRATED WATER/POWER COMPLEX
Helmut Zewen, Guenther Schmidt, and Safwat Moustafa *In its* Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 17 p refs Presented at 20th Intern. Conf. on Cooperation Mediterraneenne pour l'Energie Solaire, Rabat, Morocco, 23-27 Nov. 1981 (For primary document see N82-23137 13-99)
(MBB-UR-579-81-OE) Avail: NTIS HC A09/MF A01

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N82-22794# Comptroller General of the United States, Washington, D.C.
ENVIRONMENTAL, ECONOMIC, AND POLITICAL ISSUES IMPEDE POTOMAC RIVER CLEANUP EFFORTS Report to the Congress
6 Jan. 1982 171 p refs
(GGD-82-7; B-202338) Avail: SOD

Difficulties experienced by Federal, state, and local govern-

ments in implementing water quality programs in the Washington, D.C. metropolitan area are discussed. N.W.

N82-22795# General Accounting Office, Washington, D. C.
INFORMATION ON CALIFORNIA DELTA WATER QUALITY STANDARDS
18 Jan. 1982 11 p
(CED-82-30; B-205884) Avail: SOD

The Bureau of Reclamation's decision to voluntarily meet 1978 California water quality standards requires annually about 800,000 acre feet of water. Who will pay for this use of water is still unclear. State and Federal water officials must resolve their differences and reach new operating agreements. Information is given about potential benefits accruing to delta water users. The costs in terms of lost revenues are estimated. R.J.F.

N82-22796# General Accounting Office, Washington, D. C.
EPA SLOW IN CONTROLLING PCBs Report to the Administrator EPA
30 Dec. 1981 39 p
(CED-82-21; B-203051) Avail: SOD

In 1976 the Congress required that the Environmental Protection Agency (EPA) control the widely used chemicals, polychlorinated biphenyls (PCBs). Slow in implementing the mandate, however, EPA can offer only limited assurance that its control measures are being followed. Its enforcement program lacks overall direction and does not encourage quick compliance. Additionally, disposal facilities have developed slowly, meeting with considerable public opposition. The Government Accounting Office made several recommendations to EPA aimed at strengthening controls for the safe use and proper disposal of PCB's. R.J.F.

N82-22797*# Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
INVESTIGATION FOR IMPROVED PRECISION IN AERIAL APPLICATION EQUIPMENT Final Technical Report, 1 Oct. 1977 - 30 Sep. 1981
Lawrence O. Roth 30 Sep. 1981 209 p
(Grant NsG-6018)
Avail: NTIS HC A10/MF A01 CSCL 13B

Equipment and operating techniques to facilitate rapid field measurement and evaluation of spray distribution patterns from agricultural aircraft were developed. N.W.

N82-22798*# Kentron International, Inc., Hampton, Va.
DETERMINATION OF TURBIDITY PATTERNS IN LAKE CHICOT FROM LANDSAT MSS IMAGERY
Stuart R. LeCroy Mar. 1982 50 p refs
(Contract NAS1-16000)
(NASA-CR-165870; NAS 1.26:165870; V-19100/2Ltr-020)
Avail: NTIS HC A03/MF A01 CSCL 13B

A historical analysis of all the applicable LANDSAT imagery was conducted on the turbidity patterns of Lake Chicot, located in the southeastern corner of Arkansas. By examining the seasonal and regional turbidity patterns, a record of sediment dynamics and possible disposition can be obtained. Sketches were generated from the suitable imagery, displaying different intensities of brightness observed in bands 5 and 7 of LANDSAT's multispectral scanner data. Differences in and between bands 5 and 7 indicate variances in the levels of surface sediment concentrations. High sediment loads are revealed when distinct patterns appear in the band 7 imagery. Additionally, the upwelled signal is exponential in nature and saturates in band 5 at low wavelengths for large concentrations of suspended solids. Author

N82-22799*# IIT Research Inst., Chicago, Ill.
AEROSPECT OPERATIONS CRITERIA FOR MERCURY THRESHOLDS Final Report
Sidney Katz 1 Feb. 1979 77 p refs
(Contract NAS8-31546; IITRI Proj. 06347)
(NASA-CR-161996; NAS 1.26:161996) Avail: NTIS HC A05/MF A01 CSCL 13B

The hazards anticipated from a large scale mercury spill during a possible failure in the preflight and early flight stages of the Space Shuttle were studied. Toxicity thresholds were investigated as well as other consequences of mercury interacting with the environment. Three sites of mercury spill were investigated: land, water, and atmosphere. A laboratory study of interactions between mercury vapor and ozone in a low pressure, high ultraviolet radiation environment approximated the conditions of a mercury vapor release in the ozone layer region of the stratosphere. Clear evidence of an interaction leading to the destruction of ozone by conversion to oxygen was obtained. The impact of a spill on the Earth's environment and methods of early detection of a developing hazard wave of primary concern in the study. M.D.K.

N82-22800# National Inst. for Water Research, Pretoria (South Africa).
GUIDELINES FOR THE CONTROL OF EUTROPHICATION IN SOUTH AFRICA
R. D. Walmsley and M. Butty [1982] 28 p refs Prepared in cooperation with the Water Research Commission
Avail: NTIS HC A03/MF A01

The overall concept of eutrophication is considered. Recent advances in the understanding of the process are presented with special reference to impoundments. Recommendations and guidelines for the control of eutrophication are presented. The various parameters required to measure eutrophication and criteria used to assess trophic status are considered. A eutrophication model which describes the amount of algal growth within an impoundment in relation to its phosphate loading and water transparency is presented. N.W.

N82-22801*# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
MEASUREMENT OF SPEECH LEVELS IN THE PRESENCE OF TIME VARYING BACKGROUND NOISE Final Report
Karl S. Pearsons and Richard D. Horonjeff Washington Apr. 1982 80 p refs
(Contract NAS1-16521)
(NASA-CR-3547; NAS 1.26:3547; Rept-4554) Avail: NTIS HC A05/MF A01 CSCL 13B

Short-term speech level measurements which could be used to note changes in vocal effort in a time varying noise environment were studied. Knowing the changes in speech level would in turn allow prediction of intelligibility in the presence of aircraft flyover noise. Tests indicated that it is possible to use two second samples of speech to estimate long term root mean square speech levels. Other tests were also performed in which people read out loud during aircraft flyover noise. Results of these tests indicate that people do indeed raise their voice during flyovers at a rate of about 3-1/2 dB for each 10 dB increase in background level. This finding is in agreement with other tests of speech levels in the presence of steady state background noise. R.J.F.

N82-22802# Illinois Univ., Urbana. Inst. for Environmental Studies.
RESOLUTION OF SOURCE CONTRIBUTIONS TO ENVIRONMENTAL SAMPLES Progress Report, 1 Jul. 1980 - 30 Jun. 1981
P. K. Hopke Jul. 1981 37 p refs
(Contract DE-AC02-80EV-10403)
(DE82-002765; DOE/EV-10403/4) Avail: NTIS HC A03/MF A01

The methods for applying target transformation factor analysis to the quantitative apportionment of environmental samples such as airborne particular matter to sources and to verify the methodologies using sample mixtures were investigated. An iterative procedure using a weighted rotation was demonstrated capable of developing source profiles with no a priori assumptions. A calculational approach to the determination of uncertainties in the factor loadings and scores was developed. The use of factor analysis to identify major mineral phases in coal and the application of factor analysis to the identification of errors in large data sets was also explored. A set of artificial mixtures was produced, chemically analyzed, and subjected to factor analysis. The factor analysis results are qualitatively correct but the quantitative results are not sufficiently accurate. DOE

N82-22803# Department of Energy, Mines and Resources, Ottawa (Ontario). Center for Mineral and Energy Technology.
EFFECT OF HEATED DIESEL FUEL ON PARTICULATE GENERATION AND FUEL CONSUMPTION FOR A DEUTZ F6L 912 ENGINE

E. D. Dainty and J. P. Mogan Jun. 1980 10 p
(DE82-900385; ERP/ERL-80-65(TR)) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The effects of fuel temperature on fuel consumption and on the concentrations of CO and carbon particulate matter in the exhaust gases generated at near maximum load/speed operating conditions was determined. It is found that for a given engine torque and speed, and fuel temperature increases from 750 F/240 C to 180DF/830 C: there is no significant variation in fuel flow rate; there is no significant overall variation in the generation of particulate matter; and a minor 12% reduction in the generation of CO takes place. It dos not appear that this emissions reduction strategy is useful in underground applications where IDI engines are widely used. DOE

N82-22804# Research Inst. of National Defence, Umea (Sweden). Huvudavdelning 4.

EQUIPMENT AND METHODOLOGY FOR SAMPLING AND ANALYZING AIRBORNE MICROORGANISMS [SAMMANSTAELLNING AV APPARATUR OCH METODIK FOER PROVTAGNING OCH ANALYS AV LUFTBURNA MIKROORGANISMER]

Eva Henningsson Mar. 1981 80 p refs In SWEDISH
(FOA-C-40131-B1) Avail: NTIS HC A05/MF A01

Commonly used instruments for sampling viable airborne microorganisms are described and compared. Special attention is paid to the technical details and the area of application in order to simplify the choice of the correct apparatus for making measurements in different environments. An example of the way a study of airborne microorganisms is conducted is included, and recommendations are made for choosing which means to use. J.D.

N82-22805# Bayer A.G., Leverkusen (West Germany). Zentralbereich Ingenieurverwaltung.

THERMAL CLEANING OF TEMPORARILY EXPLOSIVE WASTE AIR Final Report

Werner Huening Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 23 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-81-015; ISSN-0171-7618) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 5

A process for safe thermal cleaning of polluted air with flow rate and concentration of hydrocarbons varying over a wide range with respect to the expense was developed. The process solves the problems of burning technique and safety in combustion plants for the treatment of explodable waste air. A flashback-proof burner and safety and control equipment were developed. An improved burning technique ensures the cleaning of polluted air even with contents and flow varying over wide limits. A test under operational conditions showed good integration of all process elements. Author (ESA)

N82-22806# Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht (West Germany). Inst. fuer Physik.

DETERMINATION OF ABSORPTION CROSS SECTIONS OF ATMOSPHERIC HARMFUL GASES IN THE INFRARED RANGE Thesis - Hamburg Univ. [BESTIMMUNG VON ABSORPTIONSQUERSCHNITTEN ATMOSPHAERISCHER SCHADGASE IM INFRAROTBEREICH]

Peter Pokrowsky 11 Aug. 1981 80 p refs In GERMAN; ENGLISH summary
(GKSS-81/E/34; ISSN-0344-9629) Avail: NTIS HC A05/MF A01

The absorption cross sections of the pollutants SO2, N2O, NO, NO2, NH3, H2S and HCl were determined at wavelengths between 3.5 and 4.0 microns in support of systems for the detection of air pollution by infrared absorption measurements. With a DF laser lidar system, SO2, N2O, and HCl are detected in the atmosphere at low concentrations. A system for the local detection of air pollutants was built. Sensitive detection is achieved by using a frequency modulated diode laser spectrometer. This spectrometer was used in a field experiment for the measurement of HCl in the plumes of incineration ships. Author (ESA)

N82-22807# Delft Hydraulics Lab. (Netherlands).

A MODEL APPROACH TO THE RHINE RIVER

R. Klomp and J. A. vanPagee Aug. 1981 24 p refs Presented at 14th Holiday Course in Waste Water Treatment De Rijn, Delft, 19-20 Apr. 1979
(Publ-256) Avail: NTIS HC A02/MF A01

A model of the relationship between pollution discharge and downstream water quality after cleaning is described. It calculates effects of the sanitation strategies of the Rhine countries. The model, based on QUALL 2, consists of coupled differential equations based on the mass transport equation. The other terms consist of reactions (between nutrient cycle, algal dynamics, oxygen budget), discharges and withdrawals. Modules for nonbiodegradables, organic and particulate nitrogen and phosphorus are included. General modules account for nonconservative substances which are described by an additional first order decay mechanism without interactions and for conservative substances, like chloride. For 1985, the model predicts an increase in oxygen content, decrease in biochemical oxygen demand, decrease in NH4, increase in NO3, and a slight increase in phosphate content. The modelling of diffuse discharges, algae dynamics and denitrification needs to be modified. Author (ESA)

N82-22808# National Aerospace Lab., Amsterdam (Netherlands). Wetenschappelijke Diensten Hoofdafdel.

CALCULATION OF THE CONTRIBUTIONS OF AIR TRAFFIC AND ROAD TRAFFIC TO AIR POLLUTION IN THE REGION OF SCHIPHOL AIRPORT IN 1974

J. J. Tiggelaar Oct. 1981 51 p refs In DUTCH; ENGLISH summary Sponsored by Netherlands Ministerie van Volksgezondheid en Milieuhygiene
(NLR-TR-77100-U) Avail: NTIS HC A04/MF A01

Annual and quarterly averages of CO, NOx and CxHy concentrations in the Schiphol airport region are calculated using a mathematical model. The method models traffic into a set of line and point sources with constant emission. For CO and NOx the road traffic contribution to air pollution is largest, while for CxHy the air traffic contribution is largest. The measurements suggest that other sources contribute at least as much to global air pollution as do road and air traffic. Author (ESA)

N82-22809# Stockholm Univ. (Sweden). Dept. of Meteorology.

SODIUM IN PRECIPITATION: A PRESENTATION OF DATA FROM THE EUROPEAN AIR CHEMISTRY NETWORK (EACN)

Rolf Soederlund and Lennart Granat 13 Oct. 1981 94 p refs
(Contracts NFR-G-GU-3922-103; NFR-G-UR-0223-110; NE-6413082-81-Fp; NE-6413511-80-Fp)
(CM-54) Avail: NTIS HC A05/MF A01

The sodium content of monthly precipitation samples collected in EACN was analyzed. A seasonal variation of the sodium concentration is noted with high concentration in October through February and lowest concentration in July and August. The main sources are the sea and windblown soil dust. No long term change in concentration is observed over the time period studied (1955 to 1979). Author (ESA)

N82-22810# STEAG A.G., Essen (West Germany). Hauptbereich Kraftwirtschaft.

MELTING CHAMBER COMBUSTION WITH REDUCED EMISSION OF NITROGEN OXIDES Final Report

Horst Stebel and Udo Strauss Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 32 p refs In GERMAN; ENGLISH summary Sponsored bu Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-228; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 7,55

A pilot plant intended to test a stoking concept, incorporating melting chambers with reduced emission of NOx, is described. Comparable liquefied coal combustion schemes show values of NOx emission of 950 to 1150 vpm. Values for the pilot plant of 650 vpm are realized, combining stable stoking of the melting chamber and flame optimization. It is found that it is possible to recirculate up to 14% of total flue gas through the combustion chamber. Under these conditions NOx emissions are reduced

to 540 vpm, however, variable accommodation of the recirculated flue gas volume to the boiler load regime is necessary.
Author (ESA)

N82-22811# Southwest Research Inst., San Antonio, Tex. Dept. of Emissions Research.
CHARACTERIZATION OF EXHAUST EMISSIONS FROM HIGH MILEAGE CATALYST-EQUIPPED AUTOMOBILES
Lawrence R. Smith Sep. 1981 191 p refs
(Contract EPA-68-03-2884)
(PB82-131566; EPA-460/3-81-024) Avail: NTIS
HC A09/MF A01 CSCL 13B

Ten automobiles were evaluated (as-received and after a tune-up to manufacturer's specifications) over the Light-Duty Federal Test Procedure (FTP) and the Highway Fuel Economy Driving Schedule (HFET). Exhaust constituents measured, in addition to the regulated emissions, include: aldehydes, particulates, sulfides, amines, metals, and several additional elements and compounds. Additional evaluations involved the measurement of the regulated emissions over four short-test procedures. GRA

N82-22812# Metrics, Inc., Atlanta, Ga.
REPORT OF SOUTHEASTERN REGIONAL WORKSHOP ON OCEAN POLLUTION MONITORING
Nancy J. Hooper Jun. 1981 61 p refs Workshop held at Atlanta, 27-28 Jan. 1981 Sponsored by NOAA and EPA
(PB82-126384; NOAA-81092512) Avail: NTIS
HC A04/MF A01 CSCL 13B

The status and requirements of marine pollution monitoring programs along the South Atlantic and Eastern Gulf of Mexico coasts are summarized. A brief discussion of the First Federal Plan, a summary of the Report of the South Atlantic and Gulf Region Conference on Marine Pollution Programs, and definitions and recommendations are included. T.M.

N82-22813# National Oceanic and Atmospheric Administration, Boulder, Colo. Office of Marine Pollution Assessment.
REPORT OF SOUTHWEST REGIONAL WORKSHOP ON OCEAN POLLUTION MONITORING
Robert E. Serra, ed. (Oregon State Univ.) Jun. 1981 110 p refs Conf. held in Pasadena, Calif., 18-20 Nov. 1980
(PB82-126376; NOAA-81092516) Avail: NTIS
HC A06/MF A01 CSCL 13B

The results of conference on the status and requirements of marine pollution monitoring programs along the coasts of California and Hawaii are summarized. The purpose of the meeting was to provide updated information on the status of marine pollution monitoring programs for the next Federal Plan. A summary was presented by local and municipal agency groups, the industry group, and state and Federal agencies. GRA

N82-22814# National Oceanic and Atmospheric Administration, Boulder, Colo. Office of Marine Pollution Assessment.
REPORT OF WESTERN GULF REGIONAL WORKSHOP ON OCEAN POLLUTION MONITORING
Nancy J. Hooper (Metrics, Inc.) Jun. 1981 66 p refs Conf. held in New Orleans, 16-17 Dec. 1980
(PB82-126368; NOAA-81092514) Avail: NTIS
HC A04/MF A01 CSCL 13B

The status and requirements of marine pollution monitoring programs along the Western coast of the Gulf of Mexico are summarized. The first Federal plan is discussed. A summary of the report of the South Atlantic and Gulf Region conference on marine pollution problems is presented along with definitions and recommendations of the monitoring workshop are discussed. Included are summaries of the presentations by representatives of Federal agencies, industry, and state agencies. GRA

N82-22815# National Oceanic and Atmospheric Administration, Boulder, Colo. Office of Marine Pollution Assessment.
REPORT OF NORTHEAST REGIONAL WORKSHOP ON OCEAN POLLUTION MONTORING
Charles G. Gunnerson Jun. 1981 90 p refs Conf. held in Stony Brook, N.Y., 10-12 Sep. 1980
(PB82-126350; NOAA-81092515) Avail: NTIS
HC A05/MF A01 CSCL 13B

The findings of the Northeast Regional Ocean Pollution Monitoring Workshop are summarized. Existing inventories of Northeast regional marine pollution monitoring programs were incomplete and further investigation is needed to determine the significance of these omissions. Present ocean monitoring programs include the pilot Northeast monitoring program and ocean dumping monitoring program, shellfish sanitation programs, and a number of municipal and industrial compliance monitoring programs. GRA

N82-22816# National Oceanic and Atmospheric Administration, Boulder, Colo. Office of Marine Pollution Assessment.
REPORT OF NORTHWEST REGIONAL WORKSHOP ON OCEAN POLLUTION MONITORING
Robert E. Serra, ed. (Oregon State Univ.) Jun. 1981 148 p refs Conf. held in Seattle, 6-8 Jan. 1981
(PB82-126343; NOAA-81092511) Avail: NTIS
HC A07/MF A01 CSCL 13B

The status and requirements of marine pollution monitoring programs along the coasts of Oregon, Washington, and Alaska are summarized. The purpose of the meeting was to provide updated information on the status of marine pollution monitoring programs for the next Federal Plan. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N82-22817 Pennsylvania State Univ., University Park.
GEOLOGY AND GEOCHRONOLOGY OF THE EASTERN SALMON RIVER MOUNTAINS, IDAHO, AND IMPLICATIONS FOR REGIONAL PRECAMBRIAN TECTONICS Ph.D. Thesis
Karl Vierling Evans 1981 251 p
Avail: Univ. Microfilms Order No. 8129157

The eastern Salmon River Mountains of east central Idaho are composed primarily of Precambrian Y metasedimentary rocks over 10,000 meters thick. Correlation with the Bell Supergroup of western Montana and northern Idaho has at various times been proposed and denied. The outcome of this controversy has direct bearing on the nature of the western margin of the North American craton during the Proterozoic. Regional inferences derived from this study are as follows: (1) the east central Idaho section and the Bell Supergroup are most likely time equivalent deposits; (2) the influx of sediments from the southwest into the Bell Basin does not require a source older than rocks equivalent to the lower pair of the Bell Supergroup and consequently; (3) there is no need to postulate a major Proterozoic high exposing pre-Beltian rocks in central Idaho ('Salmon River Arch' of Armstrong, 1975), at least in the strict sense of the original definition. Dissert. Abstr.

N82-22818 Iowa State Univ. of Science and Technology, Ames.
PLIO-PLEISTOCENE GEOLOGY OF THE CENTRAL CAGAYAN VALLEY, NORTHERN LUZON, PHILIPPINES Ph.D. Thesis
Mark Evan Mathisen 1981 218 p
Avail: Univ. Microfilms Order No. 8128837

The Cagayan Valley basin is a north-south trending interarc basin in which 10,000 meters of marine, transitional marine, and fluvial sediments have been deposited since the Oligocene. The Plio-Pleistocene sediments have been divided into two lithostratigraphic units, the Plio-Pleistocene Ilagan Formation is divided into two members, a Lower Member formed by 310 m of interbedded sandstone and mudstone, and an Upper Member formed by 500 m of pebble conglomerates, sandstones, siltstones, tuffs, and claystones. The Awidon Mesa Formation conformably overlies the Ilagan Formation and is composed of 400 m of pebble to boulder conglomerates, tuff-breccias, tuffs, sandstones, and claystones. The sediments which were derived from volcanic and plutonic igneous rocks in the adjacent volcanic arcs are predominantly composed of volcaniclastic detritus which has been diagenetically altered by dissolution and cementation processes.

Five major lithofacies are recognized in the Plio-Pleistocene sequence. Dissert. Abstr.

N82-22819 Pennsylvania State Univ., University Park.
NUMERICAL ANALYSIS OF GERDIEN PROBE FLOWS WITH APPLICATIONS TO LOWER IONOSPHERE DATA Ph.D. Thesis
Shih-Kao Chang 1981 156 p
Avail: Univ. Microfilms Order No. 8129148

New analysis of Gerdien probe flows were developed, and are applied to lower ionosphere composition data. The complete flow model appropriate for Gerdien probes is carefully constructed. The flow field is found to be strongly perturbed by the center body of the probe. The effects of slip are included in the analysis and are found to be important. Pressure drop through the probe and, most importantly, the definition of an effective inlet flow velocity are investigated. The effective inlet velocity is found to be different from the probe flight velocity. It is predicted that a condition with virtually no blockage could be achieved if the outer radius of a probe were sufficiently large. Ion trajectories with considerations of both the flow field and then applied voltage are reconstructed. The current-voltage characteristics are then reconstructed according to the ion trajectories. It is found that a double electrode condenser could reach virtual saturation at low voltages. Dissert. Abstr.

N82-22820 Pennsylvania State Univ., University Park.
NONLINEAR PHENOMENA ARISING FROM RADIO WAVE HEATING OF THE LOWER IONOSPHERE Ph.D. Thesis
Albert Andrew Tomko 1981 177 p
Avail: Univ. Microfilms Order No. 8129228

A theoretical and experimental study of the interaction of high power, high frequency (HF) radio waves with the lower ionosphere is discussed. The theoretical calculations show that the electron temperature of the ionospheric plasma can be greatly enhanced when the plasma is irradiated by a powerful groundbased HF transmitter with an effective radiated power of the order of 100 MW. If this plasma heating is maintained for times exceeding a few seconds, the composition of the plasma can also be altered. These temperature and composition modifications cause significant changes in the plasma conductivity and wave absorption in the medium. Data from the absorption experiment clearly show a large (9 dB) increase in wave absorption at 2.4 MHz due to a high power (60 MW ERP) HF heating of the ionosphere. The nonlinear demodulation experiment generated strong very low frequency (VLF) radiation when the ionosphere was irradiated by a powerful modulated HF wave. These VLF signals are believed to be due to HF heating induced conductivity modulation of the dynamo current system. Dissert. Abstr.

N82-22821*# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.
ALTERNATIVE METHODS TO SMOOTH THE EARTH'S GRAVITY FIELD
Christopher Jekeli Dec. 1981 53 p refs
(Grant NGR-36-008-161)
(NASA-CR-168758; NAS 1.26:168758; Rept-327) Avail: NTIS HC A04/MF A01 CSCL 08G

Convolutions on the sphere with corresponding convolution theorems are developed for one and two dimensional functions. Some of these results are used in a study of isotropic smoothing operators or filters. Well known filters in Fourier spectral analysis, such as the rectangular, Gaussian, and Hanning filters, are adapted for data on a sphere. The low-pass filter most often used on gravity data is the rectangular (or Pellinen) filter. However, its spectrum has relatively large sidelobes; and therefore, this filter passes a considerable part of the upper end of the gravity spectrum. The spherical adaptations of the Gaussian and Hanning filters are more efficient in suppressing the high-frequency components of the gravity field since their frequency response functions are strongly field since their frequency response functions are strongly tapered at the high frequencies with no, or small, sidelobes. Formulas are given for practical implementation of these new filters. Author

N82-22822*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMPILATION OF ATMOSPHERIC GAS CONCENTRATION PROFILES FROM 0 TO 50 KM
Mary Ann H. Smith Mar. 1982 71 p refs
(NASA-TM-83289; NAS 1.15:83289) Avail: NTIS HC A04/MF A01 CSCL 04A

A set of 52 atmospheric gas concentration profiles between 0 and 50 km was compiled as a convenient reference data set for calculation of atmospheric infrared absorption or emission signals and for initialization of iterative procedures for retrieval of gas concentrations from measured data. The distributions of volume mixing ratio as a function of altitude generally correspond to typical diurnally averaged, seasonally averaged Northern Hemisphere midlatitude gas concentration profiles. Profiles are given for all gases included in current infrared atmospheric absorption line parameter compilations, and for a number of additional important trace gases. Author

N82-22823*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPECTROSCOPIC REQUIREMENTS FOR HALOE: AN ANALYSIS OF THE HCl AND HF CHANNELS
C. P. Rinsland (College of William and Mary, Williamsburg, Va.), M. A. H. Smith, J. H. Park, Gale A. Harvey, J. M. Russell, III, and D. J. Richardson (Systems and Applied Sciences Corp., Hampton, Va.) Mar. 1982 102 p refs
(NASA-TM-83232) Avail: NTIS HC A06/MF A01 CSCL 04A

Spectral line parameters that have absorption features within the HCl and HF channels of the Halogen Occultation Experiment (HALOE) were evaluated. Line positions and identification of stratospheric and solar absorption features in both channels are presented based on an analysis of high-resolution, balloon-borne solar occultation spectra. For the relevant HCl and HF lines and for transitions of the interfering species, the accuracy of the following spectral parameters was assessed: line positions, line strengths, lower state energies, air-broadened collisional half-widths, and temperature dependence of the air-broadened half-widths. In addition, since the HALOE instrument and calibration cells are filled with mixtures of HCl in N2 and HF in N2, the self-broadened and N2-broadened HF and HCl half-widths were also considered. B.W.

N82-22824*# Maryland Univ., College Park. Dept. of Meteorology.
MULTIDISCIPLINARY RESEARCH PROGRAM IN ATMOSPHERIC SCIENCE Final Report
Owen E. Thompson Apr. 1982 254 p refs
(Grant NsG-5209)
(NASA-CR-168794; NAS 1.26:168794) Avail: NTIS HC A12/MF A01 CSCL 04A

A theoretical analysis of the vertical resolving power of the High resolution Infrared Radiation Sounder (HIRS) and the Advanced Meteorological Temperature Sounder (AMTS) is carried out. The infrared transmittance weighting functions and associated radiative transfer kernels are analyzed through singular value decomposition. The AMTS was found to contain several more pieces of independent information than HIRS when the transmittances were considered, but the two instruments appeared to be much more similar when the temperature sensitive radiative transfer kernels were analyzed. The HIRS and AMTS instruments were also subjected to a thorough analysis. It was found that the two instruments should have very similar vertical resolving power below 500 mb but that AMTS should have superior resolving power above 200 mb. In the layer 200 to 500 mb the AMTS showed badly degraded spread function. Author

N82-22825# Maryland Univ., College Park. Dept. of Physics and Astronomy.
OBSERVATIONS OF THE MEAN IONIZATION STATES OF ENERGETIC PARTICLES IN THE VICINITY OF THE EARTH'S MAGNETOSPHERE
L. S. MaSung, G. Gloeckler, C. Y. Fan (Arizona Univ.), and D. Hovestadt (Max-Planck-Inst. fuer Physik und Astrophysik) [1982] 34 p refs
(TR-80-074) Avail: NTIS HC A03/MF A01

The mean ionization states of 44-260 keV/charge ions observed as bursts in and near the earth's magnetosphere were determined. The abundance ratio of heavy ions to alphas ranged from 0.04 to 0.10, with a mean value of 0.08 + or - 0.02.

The energy spectra of alphas and Z > 2 ions in these bursts are adequately represented as exponentials in energy per charge with e-folding energies of 30 to 50 keV/O. The e-folding energies of both alpha particles and heavier ions are generally harder upstream from the bow shock than in the magnetotail and magnetosheath. The elemental abundances and ionization state distribution of the heavy ions are consistent with those of the corona at an equilibrium coronal temperature of 1 to 2 million degrees, which tends to support a solar wind origin for these particles. Author

N82-22826*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A PHOTOPHONIC INSTRUMENT CONCEPT TO MEASURE ATMOSPHERIC AEROSOL ABSORPTION M.S. Thesis
Charles Dennis Engle Mar. 1982 44 p refs
(NASA-TM-84185; NAS 1.15:84185) Avail: NTIS HC A03/MF A01 CSCL 04A

A laboratory model of an instrument to measure the absorption of atmospheric aerosols was designed, built, and tested. The design was based on the photophonic phenomenon discovered by Bell and an acoustic resonator developed by Helmholtz. Experiments were done to show ways the signal amplitude could be improved and the noise reduced and to confirm the instrument was sensitive enough to be practical. The research was undertaken to develop concepts which show promise of being improvements on the instruments that are presently used to measure the absorption of the Sun's radiation by the Earth's atmospheric aerosols. L.F.M.

N82-22827*# Illinois Univ., Urbana. Aeronomy Lab.
A ROCKET-BORNE MICROPROCESSOR-BASED EXPERIMENT FOR INVESTIGATION OF ENERGETIC PARTICLES IN THE D AND E REGIONS
F. M. Braswell 1 May 1981 167 p refs
(Grant NGR-14-005-181)
(NASA-CR-168796; NAS 1.26:168796; AR-96;
ISSN-0568-0581) Avail: NTIS HC A08/MF A01 CSCL 04A

An energetic experiment using the Z80 family of microcomputer components is described. Data collected from the experiment allowed fast and efficient postprocessing, yielding both energy-spectrum and pitch-angle distribution of energetic particles in the D and E regions. Advanced microprocessor system architecture and software concepts were used in the design to cope with the large amount of data being processed. This required the Z80 system to operate at over 80% of its total capacity. The microprocessor system was included in the payloads of three rockets launched during the Energy Budget Campaign at ESRANGE, Kiruna, Sweden in November 1980. Based on preliminary examination of the data, the performance of the experiment was satisfactory and good data were obtained on the energy spectrum and pitch-angle distribution of the particles. Author

N82-22828# Illinois Univ., Urbana. Aeronomy Lab.
CORRELATIVE STUDIES OF THE MESOSPHERIC SODIUM LAYER AT URBANA
D. Tetenbaum and S. K. Avery 1 Oct. 1981 63 p refs
(Grant NSF ATM-79-09982)
(Aeronomy-98; ISSN-0568-0581; UILU-ENG-81-2504) Avail: NTIS HC A04/MF A01 CSCL 04A

Correlative measurements of the mesospheric sodium layer were performed during January 18-19, March 14-15 and March 21-22, 1980 using the Urbana meteor radar and sodium lidar systems. The results show good agreement between the altitude of maximum sodium density and the altitude of the zero wind node, supporting the theory of the wind shear mechanism for the downward sweeping of ionization. Also, reconstruction of the neutral atmosphere density profile from meteor winds exhibit similar features with the small scale fluctuations apparent in the sodium data. It is suggested that the sodium layer is acting as a tracer for gravity wave motions. N.W.

N82-22829*# Illinois Univ., Urbana. Aeronomy Lab.
THEORETICAL AND LIDAR STUDIES OF THE DENSITY RESPONSE OF THE MESOSPHERIC SODIUM LAYER TO GRAVITY WAVE PERTURBATIONS
J. D. Shelton and C. S. Gardner 1 Nov. 1981 229 p refs
(Grants NGR-14-005-181; NSF ATM-79-20726)
(NASA-CR-168799; NAS 1.26:168799; AR-00;
ISSN-0568-0581) Avail: NTIS HC A11/MF A01 CSCL 04A

The density response of atmospheric layers to gravity waves is developed in two forms, an exact solution and a perturbation series solution. The degree of nonlinearity in the layer density response is described by the series solution whereas the exact solution gives insight into the nature of the responses. Density perturbation in an atmospheric layer are shown to be substantially greater than the atmospheric density perturbation associated with the propagation of a gravity wave. Because of the density gradients present in atmospheric layers, interesting effects were observed such as a phase reversal in the linear layer response which occurs near the layer peak. Once the layer response is understood, the sodium layer can be used as a tracer of atmospheric wave motions. A two dimensional digital signal processing technique was developed. Both spatial and temporal filtering are utilized to enhance the resolution by decreasing shot noise by more han 10 dB. Many of the features associated with a layer density response to gravity waves were observed in high resolution density profiles of the mesospheric sodium layer. These include nonlinearities as well as the phase reversal in the linear layer response. Author

N82-22830# National Mechanical Engineering Research Inst., Pretoria (South Africa). Geomechanics Div.
CRITICAL STUDY OF THE METHOD OF CALCULATING VIRGIN ROCK STRESSES FROM MEASUREMENT RESULTS OF THE CSIR TRIAXIAL STRAIN CELL
F. A. Vreede May 1981 66 p refs
(CSIR-ME-1679; ISBN-0-7988-1473-X) Avail: NTIS HC A04/MF A01

The manual of instructions for the user of the CSIR triaxial rock stress measuring equipment is critically examined. It is shown that the values of the rock stresses can be obtained from the strain gauge records by means of explicit formulae, which makes the manual's computer program obsolete. Furthermore statistical methods are proposed to check for faulty data and inhomogeneity in rock properties and virgin stress. The possibility of non-elastic behavior of the rock during the test is also checked. A new computer program based on the explicit functions and including the check calculations is presented. It is much more efficient than the one in the manual since it does not require computer sub-routines, allowing it to be used directly on any modern computer. The output of the new program is in a format suitable for direct inclusion in the report of an investigation using strain cell results. Author

N82-22831# National Mechanical Engineering Research Inst., Pretoria (South Africa). Geomechanics Div.
COAL SEAM EXPLORATION WITH SPECIAL REGARD TO THE APPLICATION OF SEISMIC METHODS FOR THE DETECTION OF DYKES
W. N. Merten Jul. 1981 16 p refs
(CSIR-ME-1721; ISBN-0-7988-1481-0) Avail: NTIS HC A02/MF A01

The application of in seam seismic methods for coal seam exploration in connection with longwall mining is evaluated. The present exploration practice is reviewed. With the introduction of the relatively expensive high production longwall mining technique, in seam seismic methods are important to successful mining operations. The basics of relevant seismic methods are described, and a research outline is suggested. A detection of dykes is presented as a preliminary emphasis. S.L.

N82-22832# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Geodesy.
GEODETIC MONITORING OF TECTONIC INFORMATION. TOWARD A STRATEGY
1981 118 p refs
Avail: NTIS HC A06/MF A01 CSCL 08G

The time scale and time lapse over which crustal movements are traditionally monitored by geodesy and seismology was studied. Efforts are made to bridge this gap through increasing the frequency of geodetic measurements in the regions of particular interests, establishment of a global network of long and ultralong period seismometers, and development of geophysical and

geodetic intrumentation that should be capable of measuring rates of crustal deformation over arbitrary time scales. The following measurements were undertaken: (1) on a global scale; (2) deformation near active plate boundaries; (3) deformation within plate interiors and other neotectonic motion; and (4) instrumentation for measuring tectonic deformation. E.A.K.

N82-22833# Atomic Weapons Research Establishment, Aldermaston (England).

THE ESTIMATION OF SEISMIC BODY WAVE SIGNALS IN THE PRESENCE OF OCEANIC MICROSEISMS

A. Douglas and J. B. Young Dec. 1981 105 p refs
(AWRE-O-14/81; ISBN-0-8551-8145-1) Avail: NTIS HC A06/MF A01

Broadband recordings from a seismometer array were processed to estimate signal shape. Single seismograph and multichannel recordings are considered. Processing methods are reviewed. Spatial Wiener filtering is applied. It is shown that the minimum power method is a special case of Wiener filtering. Noise reductions up to sixfold are achieved. The minimum power method is inferior to standard Wiener filtering. Wiener filtering succeeds when frequency filtering is necessary and has a better detection threshold for narrow band short period recordings. Noise correlations are best achieved using a section of observed noise ahead of the signal to which a small proportion of white noise is added. Author (ESA)

N82-22834# Kentucky Univ., Lexington. Inst. for Mining and Minerals Research.

PETROGRAPHIC CHARACTERIZATION OF KENTUCKY COALS Annual Report

J. C. Hower, John C. Ferm, James C. Cobb, Eric J. Trinkle, Kathleen Adams Frankie, and Steven H. Poe 29 Sep. 1981 19 p refs
(Contract DE-FG62-80PC-30223)
(DE82-000411; DOE/PC-30223/T2) Avail: NTIS HC A02/MF A01

The petrography of Kentucky coal was studied. Semi-inert macerals, spectral fluorescence of liptinites, and pyrite size/form/microlithotype distribution are investigated. DOE

N82-22835# Dames and Moore, Cranford, N.J.

EVALUATION OF CRITERIA FOR DEFINING TECTONIC, SEISMIC OR SEISMOTECTONIC PROVINCES

May 1980 31 p refs Prepared for the Atomic Energy Control (INFO-0012) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

A compilation and genetic critique of the diagnostic siting criteria to delineate or approximate bounded tectonic, seismic or seismotectonic provinces or zones, are presented. The criteria are referenced and tabulated to facilitate determination of their regulatory, scientific and practical application to siting of important engineered structures. DOE

N82-22836# Natural Environment Research Council, London (England).

GEOGMATIC BULLETIN-9. MAGNETIC RESULTS 1973-1977: ESKDALEMUIR, HARTLAND AND LERWICK OBSERVATORIES

1980 316 p refs
(ISBN-0-11884154) Avail: NTIS HC A14/MF A01; HMSO £12.50; PHI

The results of the standard observations carried out at Eskdalemuir, Hartland, and Lerwick laboratories for the years 1973 to 1977 inclusive are presented. Details of the observatories and their site plans are included. The measurements show hourly means of horizontal and vertical intensity, and hourly means of magnetic declination, together with K indices, mean monthly and annual values of the geomagnetic elements, adopted baseline values, adopted scale values, and observed and allocated baseline values for horizontal and vertical intensity and magnetic declination. Author (ESA)

N82-22837# Institute of Geological Sciences, London (England).

ANNUAL MEAN VALUES OF GEOMAGNETIC ELEMENTS, 1978

A. G. Lewis 1981 308 p refs
(Geomagnetic-Bull-10; ISBN-0-11-884130-0) Avail: NTIS HC A14/MF A01; HMSO £19; PHI

Worldwide geomagnetic data from 1913 to 1978 is presented. The catalog incorporates the 1948 compilation by Bock and Schumann, values derived from Pushkov and Ivchenko, and a world data center listing. These data are supplemented by results from observatory year books and questionnaires. Geographic/geomagnetic coordinates, height above mean sea level and years of operation are given for each observatory. Declination, inclination and intensities are listed. Maps showing observatory positions are provided. Author (ESA)

N82-22838# Natural Environment Research Council, London (England).

MAGNETIC RESULTS, 1978 TO 1979, ESKDALEMUIR, HARTLAND AND LERWICK OBSERVATORIES

1981 137 p refs
(Geomagnetic-Bull-11; ISSN-0-11-884131-9) Avail: NTIS HC A07/MF A01; HMSO £13; PHI

The declination, inclination and horizontal, vertical, north, east, and total magnetic intensities recorded at three British observatories are presented. Hourly horizontal and vertical intensities are tabulated in 1 nT units. Hourly declinations are expressed in units of 1/10 arcmin. The lower limit for k = 9 is 500 nT at Hartland, 700 nT at Eskdalemuir, and 1000 nT at Lerwick. Author (ESA)

N82-22839# Engins Matra, Velizy (France).

POSTFLIGHT ANALYSIS OF THE IR EARTH SENSOR SODERN STA 03 (THERMOPILE STATIC SENSOR) ONBOARD OTS 2. STUDY OF ATMOSPHERIC RADIATION IN THE 14 TO 16.6 MICROMETER RANGE [ANALYSE DU FONCTIONNEMENT EN VOL DU SENSEUR TERRESTRE INFRA ROUGE SODERN STA 03 (SENSEUR STATIQUE A THERMOPILES) EMBARQUE SUR OTS 2. ETUDE DU RAYONNEMENT DE L'ATMOSPHERE DANS L'INTERVALLE 14-16.6 MICROMETRES]

Philippe Moulinier 1981 116 p In FRENCH Presented at Stagiaire ECP, France, 23 Mar. - 30 Jun. 1981
Avail: NTIS HC A06/MF A01

Data from the IR Earth sensors onboard the OTS 2 geostationary satellite were examined. An experimental model of terrestrial luminance was established. The OTS 2 orbit and attitude control system was piloted, using measurements from the Sodern IR sensor. The Sodern instrument views an image of the Earth through an optical system; the projected image partially illuminates a configuration of thermopiles. The Earth sensor Galileo, redundant to Sodern, which operates on a scanning principle was also monitored. Both instruments transmitted instanteous values for spacecraft roll and pitch. Differences in measurements from the two sensors are explained a posteriori. Short term variations in terrestrial luminance are characterized. Author (ESA)

N82-22840# Kiruna Geophysical Inst. (Sweden).

COMPOSITION OF THE HOT MAGNETOSPHERIC PLASMA AS OBSERVED WITH THE PROGNOZ-7 SATELLITE

Rickard Lundin, Bengt Hultqvist, A. Pissarenko (Academy of Sciences, Moscow), and A. Zackarov (Academy of Sciences, Moscow) Dec. 1981 71 p refs Submitted for publication Sponsored in part by Swedish Board for Space Activities
(KGI-Preprint-054; ISSN-0349-2656) Avail: NTIS HC A04/MF A01

The PROGNOZ 7 ion composition data in the 0.2 to 17 keV/q energy range are discussed. Plasma mantle, dayside boundary layer, auroral particles at 2 to 5 R sub e altitude, and ring current are considered. In the plasma mantle the particle motions in the deep nightside are adiabatic and penetrated solar wind plasma elements are frequently observed. The dayside boundary layer consists of poorly mixed magnetosheath and magnetosphere plasmas, with impulsive penetration of the magnetosphere by magnetosheath plasma. The boundary layer electric field has a strong radial component. The O+ ions dominate the dayside magnetospheric plasma during magnetic storms for energies up to 17 keV. Strongly peaked ion spectra are found in the inner ring current. Author (ESA)

N82-22841# Kiruna Geophysical Inst. (Sweden).

OBSERVATIONS OF OUTFLOWING ION BEAMS ON

AURORAL FIELD LINES AT ALTITUDES OF MANY EARTH RADII

R. Lundin, B. Hultqvist, E. Dubinin (Academy of Sciences, Moscow), A. Zackarov (Academy of Sciences, Moscow), and N. Pissarenko (Academy of Sciences, Moscow) Dec. 1981 31 p refs Submitted for publication Sponsored in part by Swedish Board for Space Activities

(KGI-Preprint-055; ISSN-0349-2656) Avail: NTIS HC A02/MF A01

The composition, energy and angular characteristics of upward flowing ionospheric ions at altitudes > 20.000 km were studied by PROGNOZ 7. Very narrow beams are found up to altitudes > 30.000 km on the nightside. At much higher altitudes and in regions connected to the dayside/flank boundary layer and plasma mantle, the beams are much broader than expected from adiabatic particle motions from an ionospheric source/acceleration region, which suggests the presence of pitch angle scattering or transverse acceleration processes. Considerable mass dispersion effects are observed in upward flowing ionospheric ion beams. The peak energy for the O+ ions is greater by several keV compared to that of the H+ ions in the same ion beam at altitudes > 20.000 km. Mass dispersion effects are noted at altitudes where the upflowing ionospheric ions are intermixed with magnetosheath ions. Author (ESA)

N82-22842# Danish Meterorological Inst., Copenhagen. Ionosphere Lab.

COMPILATION OF RIOMETER DATA FOR THE ENERGY BUDGET CAMPAIGN OCTOBER - NOVEMBER 1980

Peter Stauning 25 Mar. 1981 35 p

(DMI-Geophys-Papers-R-63) Avail: NTIS HC A03/MF A01

Absorption data obtained from a net of riometers located at observatories in Greenland, at Jan Mayen, Iceland, Faroe Islands, Svalbard and North Norway are presented. Riometer absorption intensities are shown for a period of 2 days around balloon and rocket launches. One minute averaged values are plotted in diagrams of 4hr intervals around launch times.

Author (ESA)

N82-22843# Technische Universitaet, Brunswick (West Germany). Inst. fuer Physikalische Chemie.

INVESTIGATIONS TO PREDICT AND REDUCE THE EVAPORATION RATE OF THE RESIDUAL BRINE IN SALT CAVERNS USED FOR GAS STORAGE Final Report, Dec. 1980

Hans-Juergen Petrick, Heiko Karl Cammenga, and Detlef Herz Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 42 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-81-226; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 8,80

Tensides were tested for their ability to reduce the evaporation rate of residual brine in salt caverns used for gas storage. Fatty alcohols with more than 20 CH2 groups and perfluorinated alcohols with more than 12 CF 2 groups prove especially useful. The formation of a solid salt crust on the initialy free brine surface is due to the incorporation of alkaline Earth ions. After its completion, the solid salt crust enormously reduces the evaporation rate of the underlying brine. It is found that by the use of different tensides, crust formation can be either enhanced of retarded at will. Author (ESA)

N82-22844# Oulu Univ. (Finland). Dept. of Physics.

ANOMALOUS MULTIPLE TRACES BELOW f SUB O E IN HIGH GAIN IONOGRAMS RECORDED AT SODANKYLAA

T. Nygren, L. Jalonen, and T. Turunen (Geophysical Obs., Sodankylaa, Finland) Feb. 1980 26 p refs

(Rept-70/1981; ISBN-951-42-0801-3; ISSN-0356-1852) Avail: NTIS HC A03/MF A01

Anomalous multiple trace patterns were studied. Ionograms were simulated and the intensities of the multiple echoes were estimated to study anomalous multiple trace patterns. The virtual heights of the two reflection levels were calculated for the different frequencies, using electron density profiles. The group path was obtained by integrating the group refraction index from the transmitter to the reflection level. A correlation exists between the daily variations of the occurrence of the multiples and high type sporadic E-layers. The multiples are caused by vertically propagating waves coupled from o to z-mode in the lower E-region which bounce back and forth between a partially transparent sporadic E-layer and the lower F-region. Author (ESA)

N82-22845# Fairleigh Dickinson Univ., St. Croix (Virgin Islands). Marine Geology Group.

THE PRODUCTION, TRANSPORTATION, AND DEPOSITION OF CARBONATE SEDIMENTS ON THE INSULAR SHELF OF ST. CROIX, U.S. VIRGIN ISLAND Final Report

Dennis K. Hubbard, James L. Sadd, Arnold I. Miller, Ivan P. Gill, and Robert F. Dill Feb. 1981 159 p refs

(Grant NOAA-04-8-M01-135)

(PB82-126400; TR/MG-1; WEST-INDIES-CONTRIB-76; NOAA-8109804) Avail: NTIS HC A08/MF A01 CSCL 08G

The findings of a 2 year program to inventory major sediment sources on the St. Croix insular shelf, and the factors responsible for their presence are summarized. Sand supplies fall into two categories: existing sand bodies occur along the wider southern shelf. One contains medium to fine grained sand. Further to the west, another sand body occurs which contains a larger undetermined volume of sandy sediment. Along the narrow northern shelf there are no major sediments storage sites, and most of the sediment is rapidly moved offshore into the adjacent basin. Two submarine canyons occur, but their storage capacity relative to that of the sand bodies on the south shore is small. GRA

N82-22846*# National Academy of Sciences - National Research Council, Washington, D. C. Panel on Crustal Movement Measurements.

GEODETIC MONITORING OF TECTONIC DEFORMATION: TOWARD A STRATEGY Final Report

Nov. 1981 121 p refs Sponsored in part by Defense Mapping Agency, Washington; NASA, Washington; NOAA, Washington; and Geological Survey, Reston, Va.

(NASA-CR-168784; NAS 1.26:168784; PB82-137118) Avail: NTIS HC A06/MF A01 CSCL 08E

Issues of interest and importance to society and science are presented. The problems considered are of national concern; their solutions may contribute to a better understanding of tectonic deformation and earthquake hazards. The need for additional field data, the role of geodetic measurements, the importance of both ground and space techniques, and the need for advanced instrumentation development are discussed. GRA

N82-23113*# Arkansas Coll., Batesville.

DETERMINATION OF WATER-SOLUBLE IONS IN SOILS FROM THE DRY VALLEYS OF ANTARCTICA

Roberta Bustin *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 16 p refs (For primary document see N82-23108 13-99)

Avail: NTIS HC A14/MF A01 CSCL 08M

N82-23132*# Buffalo State Univ. Coll., N.Y. Dept. of Geosciences.

THE TECTONICS OF ANORTHOSITE MASSIFS Final Report

Carl K. Seyfert *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 29 p refs (For primary document see N82-23122 13-99)

Avail: NTIS HC A17/MF A01 CSCL 08G

N82-23135*# Houston Baptist Univ., Tex.

MEASUREMENT OF TRACE LEVELS OF CHLORINE IN THE STRATOSPHERE Final Report

Doris C. Warren *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 15 p refs (For primary document see N82-23122 13-99)

Avail: NTIS HC A17/MF A01 CSCL 04A

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N82-22847 Iowa State Univ. of Science and Technology, Ames.

A DIAGNOSTIC STUDY OF THE SPECTRAL ENERGETICS

OF BLOCKING Ph.D. Thesis
Anthony Regis Hansen 1981 198 p
Avail: Univ. Microfilms Order No. 8128823

The spectral energetics of individual blocking case studies selected from the winters of 1976-77, 1977-78, and 1978-79 are calculated. The time evolution and geographical distribution of the energetics of the ensembles of planetary-scale waves (zonal harmonic wavenumbers 1-4) and intermediate-scale waves (zonal harmonic wavenumbers 5-10) are examined to qualitatively identify the physical mechanisms important in the blocking process. Distinctions are drawn between blocks occurring over the North Atlantic and North Pacific Oceans, as well as between high latitude and middle latitude blocks. Two distinct forcing mechanisms were found. Atlantic blocking in the sample of cases was forced primarily by the nonlinear interaction of intense, baroclinic cyclone-scale waves with the ultralong waves. Pacific blocking resulted from the baroclinic amplification of planetary-scale waves. Dissert. Abstr.

N82-22848*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE 1981 DIRECT STRIKE LIGHTNING DATA
Felix L. Pitts and Mitchel E. Thomas Mar. 1982 40 p refs
(NASA-TM-83273; NAS 1.15:83273) Avail: NTIS HC A03/MF A01 CSCL 04B

Data waveforms obtained during the 1981 direct strike lightning tests, utilizing the NASA F-106B aircraft specially instrumented for lightning electromagnetic measurements are presented. The aircraft was operated in a thunderstorm environment to elicit strikes. Electromagnetic field data were recorded for both attached lightning and free field excitation of the aircraft. N.W.

N82-22849*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
QUANTITATIVE STUDY OF LONG-TERM SOLAR AND CLIMATIC CHANGES Final Report, 1 May 1979 - 30 Sep. 1981
John A. Eddy Mar. 1982 8 p refs
(Grant NsG-5345)
(NASA-CR-168788; NAS 1.26:168788) Avail: NTIS HC A02/MF A01 CSCL 04B

Long term variations in the diameter and the shape of the Sun were studied. Daily observations of the Sun's diameter made at the Greenwich Observatory between 1836 and 1953 were analysed and interpreted. The data was converted into digital form and then screened and processed. It was found that the horizontal diameter of the Sun measured at Greenwich appears to have decreased systematically between 1880 and 1953 at a rate of 1.2 plus or minus 0.6 minutes of arc per century. R.J.F.

N82-22850*# National Aeronautics and Space Administration, Washington, D. C.
WIND MEASUREMENTS BY PARACHUTE
Sven Nordstroem Mar. 1982 39 p refs Transl. into ENGLISH of "Prov Med Vindvisering Mot Fallskaerm" Rept. FDA-C-20344-D2, Sweden, Mar. 1980 p 1-37 Original language document was announced as N81-31748 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Research Inst. of National Defense, Stockholm
(Contract NASw-3541)
(NASA-TM-76698; NAS 1.15:76698) Avail: NTIS HC A03/MF A01 CSCL 04B

Tests used the 8 cm Lotta grenade as well as 12 cm M/70 and 10.5 m/62 grenades, released at altitudes between 2000 and 6400 meters. The parachutes were tracked by AP and RFK. In later experiments wind data were also obtained for comparison by tracking hydrogen filled balloons in part with the CORA system, in part with radar. Generally radar picked up the objects without visual assistance. Wind measurements from parachutes correlated well with those obtained by balloon. Even when the radar locked on to a part of a grenade, descending faster than the parachute, some of the measurements obtained were good. Bodies with a greater rate of descent than parachutes, with less or no tendency toward drift and with sufficient, surface for radar tracking, ought to provide reliable results. The existence of vertically well defined winds of jet stream type at low altitudes was established. Author

N82-22851*# Lassen Research, Manton, Calif.
RESEARCH STUDY: SEVERE STORMS DOPPLER LIDAR SIGNAL PROCESSING Final Report
R. W. Lee 10 Mar. 1982 5 p
(Contract NAS8-33834)
(NASA-CR-161995; NAS 1.26:161995) Avail: NTIS HC A02/MF A01 CSCL 04B

Four tasks related to the signal processing aspects of the severe-storms Doppler lidar program are discussed. The development of algorithms for windfield retrieval from Doppler lidar measurements are discussed. Signal processor installation on a CV-990 aircraft is discussed. R.J.F.

N82-22852*# Texas A&M Univ., College Station. Dept. of Meteorology.
MOISTURE PROCESSES ACCOMPANYING CONVECTIVE ACTIVITY Interim Report
Meta E. Sienkiewicz and James R. Scoggins Washington NASA Apr. 1982 97 p refs
(Contract NAS8-33776)
(NASA-CR-3542; M-378; NAS 1.26:3542) Avail: NTIS HC A05/MF A01 CSCL 04B

A moisture budget analysis was performed on data collected during the AVE 7 (May 2 to 3, 1978) and AVE-SESAME1 (April 10 to 11, 1979) experiments. Local rates-of-change of moisture were compared with average moisture divergence in the same time period. Results were presented as contoured plots in the horizontal and as vertical cross sections. These results were used to develop models of the distribution of moisture processes in the vicinity of convective areas in two layers representing lower and middle tropospheric conditions. Good correspondence was found between the residual term of the moisture budget and actual precipitation. R.J.F.

N82-22853# National Oceanic and Atmospheric Administration, Rockville, Md.
OBSERVATIONS OF HURRICANE DAVID (1979) USING THE MICROWAVE SOUNDING UNIT
Norman C. Gordy and William C. Shen Apr. 1982 57 p refs
(NOAA-TR-NESS-88) Avail: NTIS HC A04/MF A01

Microwave measurements, using the microwave sounding unit, obtained for Hurricane David at four 12-h intervals, beginning September 3, 1979, when David was in the Florida Strait, until 48-h later when it approached the Georgia coast are aspected. Comparisons are made between the brightness temperature measurements for the three highest frequency channels (called 'sounding' channels) and the values computed from radiosonde data. Comparisons are also made between the radial derivative of brightness temperature for the 54.96 GHz channel and the derivatives estimated using radiosonde winds. Measurements and simulations demonstrate that the brightness temperature derivative is correlated with the winds between 700 and 500 mb. Horizontal smoothing resulting from the instrument's 110 km resolution degrades the gradient information near the hurricane center more than the spot measurements of brightness temperature. M.D.K.

N82-22854# National Oceanic and Atmospheric Administration, Rockville, Md. Earth Satellite Lab.
A STATISTICAL APPROACH TO RAINFALL ESTIMATION USING SATELLITE AND CONVENTIONAL DATA
Linwood F. Whitney, Jr. Apr. 1982 55 p refs
(NOAA-TR-NESS-89) Avail: NTIS HC A04/MF A01

A statistical approach is employed in an attempt to estimate convective rainfall using both satellite and conventional data. A variety of variables derived from both satellite and conventional meteorological sources are presented. From among these variables, a screening regression method selects those which best explain area-averaged rainfall. Among the cases studied, the relationship of each variable to rainfall is weak to poor, particularly as cases are combined. Although multivariate selections improve the relationships, inconsistency of selection develops from one case to another and from one time to another, even in the same meteorological situation. Regression equations are found to estimate the amount inadequately, even when using dependent

data. At best, rainfall is not likely to be measured quantitively by such an approach and, at worst, concern is raised about the validity of using the variables investigated to estimate rainfall.
B.W.

N82-22855# National Mechanical Engineering Research Inst., Pretoria (South Africa). Heat Mechanics Div.
EQUATIONS AND PROCEDURES FOR PLOTTING PSYCHROMETRIC CHARTS IN SI UNITS BY COMPUTER
A. Johannsen May 1981 23 p refs
(CSIR-ME-1711; ISBN-0-7988-1478-0) Avail: NTIS HC A02/MF A01

Basic equations and procedures for writing a general program capable of drawing psychrometric charts in SI units for any barometric pressure, any range of temperatures, and humidity ratios and virtually any size limited only by the size of the available plotter are presented. These equations and procedures were used in a recently developed program PSYCHART which makes use of the computer plotter to draw the charts. The program was thoroughly tested by producing numerous charts for various barometric pressures and for different ranges from low temperature charts for refrigeration, through the air conditioning range to high temperature charts for drying applications. Author

N82-22856# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
METEOROLOGICAL OBSERVATIONS AND MEASUREMENTS FROM NIGHT VISION TESTS, AUTUMN 1980 [METEOROLOGISKA OBSERVATIONER VID MAATINGAR I SAMBAND MED MOERKERSIKTESPROV, HOESTEN 1980]
Arne Haagaard, Nils-Erik Sandberg, and Sture Wickerts Apr. 1981 52 p In SWEDISH
(FOA-C-20407-D8(E3)) Avail: NTIS HC A04/MF A01

Results from meteorological measurements and results observed in conjunction with night vision tests conducted during the autumn of 1980 are presented. The tables list results from measurements and observations taken every half hour. Also presented are measurements taken with the IR Transmissometer placed within the test area. J.M.S.

N82-22857# Research Inst. of National Defence, Umea (Sweden). Huvudavdelning 4.
METEOROLOGICAL MEASURING SYSTEM AT FOA 4: PART 1 [METEOROLOGISKT MAETSYSTEM VID FOA. DEL 1]
Per Faellman, Lars Hedlund, Goeran Hulten, Hans-Goeran Larsson, Melker Nordstrand, and Sunne Olsson Jan. 1981 34 p refs In SWEDISH
(FOA-C-40128-C2(B2,A3)-Pt-1) Avail: NTIS HC A03/MF A01

Documentation of a system for field measurement of meteorological data is presented. The incoming meteorological variables are registered by monitors mounted at various heights on a 39 m tower. The transmitter signals are transferred from the monitors to the data converter for adaptation to the data collector. The data are transferred from the data collector to the central computer for conversion. System functions are outlined and detailed documentation of the exact components of the measuring system is presented. J.D.

N82-22858# Air Force Environmental Technical Applications Center, Scott AFB, Ill. Air Weather Service Office.
WILLIAMS AFB, ARIZONA REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO) PARTS A-F Final Report
21 Oct. 1981 464 p
(AD-A110246; AD-E850129; USAFETAC/DS-81/096) Avail: NTIS HC A19/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Williams AFB, Arizona. It contains the following parts: (A) Weather Conditions; Atmospheric Phenomena; (B) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C) Surface winds; (D) Ceiling versus Visibility; Sky Cover; (E) Psychrometric Summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-22859# Air Force Environmental Technical Applications Center, Scott AFB, Ill. Air Weather Service Office.
NORTON AFB, CALIFORNIA REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO) PARTS A-F Final Report
24 Sep. 1981 485 p
(AD-A110046; AD-E850118; USAFETAC/DS-81/089) Avail: NTIS HC A02/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Norton AFB, California. It contains the following parts: (A) Weather Conditions; Atmospheric Phenomena; (B) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C) Surface winds; (D) Ceiling versus Visibility; Sky Cover; (E) Psychrometric Summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-22860# Research Inst. of National Defence, Umea (Sweden). Huvudavdelning 4.
DATA ACQUISITION SYSTEMS FOR THE METEOROLOGICAL MEASURING STATION AT FOA 4 UMEA, SWEDEN [DATAINSAMLINGSSYSTEM FOER METEOROLOGISK MAETSTATION VID FOA 4 I UMEAA]
Staffan Loef, Per Faellman, Mats Johnson, and Lars Rejnus Mar. 1981 26 p refs In SWEDISH
(FOA-C-40132-C(B1)) Avail: NTIS HC A03/MF A01

A data collection system, DAMM, developed for collections and storing meteorological data from a measuring station is discussed. The system collects data on wind direction, temperatures, precipitation, humidity, and radiation. Collection of the data was accomplished with the aid of a measuring system consisting of sensors mounted on a tower, connected to a local microcomputer. Collected data was transmitted to a central computer, where it was correlated and stored in a database. The generated database can be used as a source of information and as a foundation for simulating models and various types of analytical programs.
M.D.K.

N82-22861# Royal Netherlands Meteorological Inst., De Bilt.
METEOROLOGICAL AND OCEANOGRAPHIC OBSERVATIONS ON BOARD DUTCH LIGHT VESSELS AND THE LIGHT PLATFORM, GOEREE, IN THE NORTH SEA
1981 137 p In ENGLISH and DUTCH
(KNMI-141-29) Avail: NTIS HC A07/MF A01; Royal Netherlands Meteorological Inst., De Bilt Fl 17,50

Data compiled from three-hourly meteorological and sea wave observations are presented. Meteorological and oceanographic results for general air circulation, air pressure, precipitation and fog, visibility and cloud cover are shown. Frequency distributions of air temperature, sea surface temperature, air-sea temperature difference, and of wind and waves are presented.
Author (ESA)

N82-22862# International Meteorological Inst., Stockholm (Sweden). Arrhenius Lab.
[METEOROLOGICAL ACTIVITIES IN SWEDEN] Annual Report, Jul. 1980 - Jun. 1981
Oct. 1981 39 p refs
(AR-80-81) Avail: NTIS HC A03/MF A01

Work in dynamic meteorology, climatology, geophysical fluid dynamics, chemical meteorology, and atmospheric physics is reported. Cloud modeling, global carbon, nitrogen, phosphorus cycles, aeronomy, auroral optics and atmospheric aerosols are discussed. Author (ESA)

N82-22863# National Weather Service, Salt Lake City, Utah.
FORECASTING THE ONSET OF COASTAL GALES OFF WASHINGTON-OREGON
John R. Zimmerman and William D. Burton Aug. 1981 21 p refs
(PB82-127051; NOAA-TM-NWS-WR-168; NOAA-81100802) Avail: NTIS HC A02/MF A01 CSCL 04B

Offshore buoys were shown to be useful in detecting the likelihood of coastal gales. Whenever the pressure difference between Astoria, Oregon and buoy 46005 is 9-mb or more, coastal gales for Washington should be considered. By applying screening regression to a large body of data, an objective technique was developed to determine when storms were likely to produce coastal gales and the time to gale onset. GRA

N82-22864# Atmospherics, Inc., Fresno, Calif.
SCPP DATA COLLECTION AND ANALYSIS Interim Progress Report, 1 Jul. 1980 - 31 Aug. 1981
Mark Solak, Rand Allan, Tom Henderson, Mike Henderson, Steve Pinion, Ed Pinion, Susan Barnes, and Hilda Duckering 1981 170 p refs
(Contract DI-9-07-85-V-0020)
(PB82-119587; IPR-3) Avail: NTIS HC A08/MF A01 CSCL 04B

The physical processes relevant to precipitation formation during the winter months over a portion of the Sierra Range in California are investigated. Those physical conditions which provide the highest potential for artificial enhancement of winter precipitation are identified, and the feasibility of implementing a weather resources management program for improvement of California's water resources in the Sierra Range is examined. The program has the potential for many secondary benefits such as information transfer which could be useful in research and applied programs elsewhere in the United States. A network of precipitation gages, a microphysics laboratory and, an ice detection system were used to acquire data. GRA

N82-23120*# Nebraska Wesleyan Univ., Lincoln. Dept. of Biology.
A GRADIENT MODEL OF VEGETATION AND CLIMATE UTILIZING NOAA SATELLITE IMAGERY. PHASE 1: TEXAS TRANSECT
David H. Greegor, Jr. and Jim Norwine (Texas A&I Univ., Kingsville) *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 63 p refs (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 04B

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N82-22865*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SEASAT: A SATELLITE SCATTEROMETER ILLUMINATION TIMES OF SELECTED IN SITU SITES
Lyle C. Schroeder, David R. Goodridge, Jeanne C. Boberly, J. Kenrick Hughes, and Jon L. Sweet Mar. 1982 120 p
(NASA-TM-83280; NAS 1.15:83280) Avail: NTIS HC A06/MF A01 CSCL 08J

A list of times that the SEASAT A Satellite Scatterometer (SASS) illuminated from directly above or directly abeam, selected surface sites where in situ winds were measured is provided. The list is ordered by the Greenwich Mean Time (GMT) of the midpoint of the illumination period (hit time) for a given surface site. The site identification, the orbit number and the direction from the subtrack in which the truth lies are provided. The accuracy of these times depends in part upon the ascending node times, which are estimated to be within +.1 sec, and on the illumination time relative to the ascending node, which is estimated to be within +6 seconds. The uncertainties in the times provided were judged to be sufficiently small to allow efficient and accurate extraction of SASS and in situ data at the selected surface sites. The list contains approximately six thousand hit times from 61 geographically dispersed sites. Author

N82-22866# Institute of Oceanographic Sciences, Wormley (England).
THE IOS MULTI-PURPOSE GRAVITY CORER
R. J. Morris and R. D. Peters 1981 21 p refs
(IOS-R-124) Avail: NTIS HC A02/MF A01

A stainless steel gravity corer, suitable for biological and chemical analyses, is described. The corer can sample relatively undisturbed interface samples together with a subsurface core to a depth of 1.2 m in a square box barrel which permits quick, easy access to the samples. Undisturbed archive core samples of 1.0 m in length, in 10 cm dia. round liners; and core samples of 3 m length and over, in 6 and 10 cm dia. liners can be taken. The corer, fully loaded, weighs 300 kg. In water depths of up to 6000 m, it gives a total wire load (pull out and weight of corer and wire) < 2 t. The built-in support and sampling frame keep the core sample vertical and allow safe handling in moderate sea states. There is no contamination from the square box or 10 cm diameter barrels. Interface and subsurface sediment can be satisfactorily subsampled from a square box core sample. The corer worked well on three cruises, producing samples in water depths ranging from 100 m to > 5000 m. Author (ESA)

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N82-22867*# Tufts Univ., Medford, Mass. Dept. of Physics.
PROTEIN FOLDING, PROTEIN STRUCTURE AND THE ORIGIN OF LIFE: THEORETICAL METHODS AND SOLUTIONS OF DYNAMICAL PROBLEMS
D. L. Weaver Mar. 1982 50 p refs
(NASA Order A-86784-B)
(NASA-CR-166318; NAS 1.26:166318) Avail: NTIS HC A03/MF A01 CSCL 06C

Theoretical methods and solutions of the dynamics of protein folding, protein aggregation, protein structure, and the origin of life are discussed. The elements of a dynamic model representing the initial stages of protein folding are presented. The calculation and experimental determination of the model parameters are discussed. The use of computer simulation for modeling protein folding is considered. B.W.

N82-22868*# National Aeronautics and Space Administration, Washington, D. C.
THE EFFICIENCY COEFFICIENT OF THE RAT HEART AND MUSCULAR SYSTEM AFTER PHYSICAL TRAINING AND HYPOKINESIA
Yu. S. Alyukhin and A. F. Davydov Apr. 1982 12 p refs Transl. into ENGLISH from Fiz. Zh. SSSR im I. M. Sechenova (USSR), v. 66, no. 11, 1980 p 1660-1665 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-76843; NAS 1.15:76843) Avail: NTIS HC A02/MF A01

The efficiency of an isolated heart did not change after prolonged physical training of rats for an extreme load. The increase in oxygen consumption by the entire organism in 'uphill' running as compared to the resting level in the trained rats was 14% lower than in the control animals. Prolonged hypokinesia of the rats did not elicit a change in the efficiency of the isolated heart. S.L.

N82-22869*# National Aeronautics and Space Administration, Washington, D. C.
INTRACELLULAR MECHANISM OF THE ACTION OF INHIBIN ON THE SECRETION OF FOLLICULAR STIMULATING HORMONE AND OF LUTEINIZING HORMONE INDUCED BY LH-RH IN VITRO
M. J. Lecomte-Yerna, M. T. Hazee-Hagelstein, Ch. Charlet-Renard, and P. Franchimont Apr. 1982 8 p refs Transl. into ENGLISH from Compt. Rend. des Seances (France), v. 175, no. 3, 1981 p 385-388 Transl. by Kanner (Leo) Associates, Redwood City,

Calif. Original doc. prep. by Societe de Biologie et de ses Filiales
(Contract NASw-3541)
(NASA-TM-76847; NAS 1.15:76847) Avail: NTIS HC A02/MF A01 CSCL 06C

The FSH secretion-inhibiting action of inhibin in vitro under basal conditions and also in the presence of LH-RH is suppressed by the addition of MIX, a phosphodiesterase inhibitor. In the presence of LH-RH, inhibin reduces significantly the intracellular level of cAMP in isolated pituitary cells. In contrast, the simultaneous addition of MIX and inhibin raises the cAMP level, and this stimulation is comparable to the increase observed when MIX is added alone. These observations suggest that one mode of action of inhibin could be mediated by a reduction in cAMP within the pituitary gonadotropic cell. Author

N82-22870*# National Aeronautics and Space Administration, Washington, D. C.
BEHAVIORAL STUDY OF ULTRADIAN ACTIVITY PERIODS OF OF1 MICE ENCLOSED IN EXPERIMENTAL CAGES OF DIFFERENT DIMENSIONS
A. Guillot Apr. 1982 13 p refs Transl. into ENGLISH from Comptes Rend. des Seances de la Soc. de Biol. et de ses Filiales (France), v. 175, no. 3, 1981 p 295-302 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Inst. National de la Sante et de la Recherche Medicale, Paris
(Grant NASw-3541)
(NASA-TM-76848) Avail: NTIS HC A02/MF A01 CSCL 06C

Male mice are enclosed in cages of different dimensions (cage A - 23x8x8 cm., cage B - 36x27x17 cm.), in an alternating light/dark regimen, at an ambient temperature of 22 to 23 C. The successions of the behavioral sequences of ultradian activity periods are noticed by direct observation during 11 consecutive hours in light. The experimental situation modifies the mean duration time and the behavioral organization of each activity period. However, the comparison of the overall activity time lengths and the comparison of the overall behavioral frequencies suggest that the energy spent per mouse is constant. J.M.S.

N82-22871# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
PRELIMINARY STUDY OF THE EFFECTS OF PROLONGED ACCELERATION ON SPINAL DYNAMICS OF BABOONS. 1: ACCELERATION. 2: BIOMECHANICAL ANALYSIS
Arnold R. Slonim, Marvin E. Souder, James H. Vechte, John W. Frazier, Arnold R. Slonim, and Leon E. Kazarian Jun. 1981 50 p refs
(AD-A101766; AFAMRL-TR-80-40) Avail: NTIS HC A03/MF A01 CSCL 06C

Repetitive exposures to acceleration are studied to determine if they have an effect on spinal dynamics; if they cause bone strength variations of predisposition to spinal injuries. Two baboons were exposed simultaneously to 10 plateaus of +4 Gz/30 seconds each separated by intervals of +1.5 Gz/45 seconds at the rate of two times per week for 26 weeks. The results are to control noncentrifuged baboons. Subsequently, the spinal columns of these baboons were subjected to extensive mechanical strength testing. Each vertebra of the two baboons exposed to +Gz acceleration twice a week for 26 weeks was subjected to axial compressive loading at the rate of 88 sq to the minus third power meter/sec (21 in./min) on a material testing machine. The data, analyzed by PDP 11/34 computer, were compared with data obtained previously from four noncentrifuged baboons of the same age, weight and sex. S.L.

N82-22872*# National Aeronautics and Space Administration, Washington, D. C.
CHANGE IN BLOOD GLUCOSE LEVEL IN RATS AFTER IMMOBILIZATION
R. D. Platonov, G. M. Baskakova, and S. A. Chepurnov Dec. 1981 9 p refs Transl. into ENGLISH from Biol. Nauka (USSR), no. 9, 1975 p 37-40 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75997; NAS 1.15:75997) Avail: NTIS HC A02/MF A01 CSCL 06C

Experiments were carried out on male white rats divided into four groups. In group one the blood glucose level was determined immediately after immobilization. In the other three groups, two hours following immobilization, the blood glucose level was determined every 20 minutes for 3 hours 40 minutes by the glucose oxidase method. Preliminary immobilization for 2 hours removed the increase in the blood glucose caused by the stress reaction. By the 2nd hour of immobilization in the presence of continuing stress, the blood glucose level stabilized and varied within 42 + or - 5.5 and 47 + or - 8.1 mg %. Within 2 hours after the immobilization, the differences in the blood glucose level of the rats from the control groups were statistically insignificant. Author

N82-22873# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
THE EFFECT OF PULSED MICROWAVES ON THE BREATHING OF MICE [INVERKAN AV PULSADE MIKROVAAGOR PAA ANDNING OCH KROPPSVIKT HOSS MOESS]
C.-O. Criborn, C. I. Henriksson, and C.-J. Clemedson Apr. 1981 20 p refs In SWEDISH
(FOA-C-54032-H2, H3) Avail: NTIS HC A02/MF A01

With the use of a specially constructed microwave generator, mice were exposed to microwaves synchronized to the different stages of respiration. Frequencies other than the respiratory rate effect the volume and rate of respiration in shorter intervals of exposure. Even though the animals were not heated at the low average effect, approx. 1mW/sq cm during exposure, a change in body weight was measurable. These results indicate that the thermal energy balance in mice is somehow effected. J.M.S.

N82-22874# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
THE ROLE OF BIOTECHNOLOGY IN THE DEVELOPMENT OF TECHNICAL SYSTEMS: A REFERENCE BACKGROUND
Hans Furustig Jul. 1981 68 p refs In SWEDISH
(FOA-C-56026-H2) Avail: NTIS HC A04/MF A01

Modern civilization depends on the function of manned technical systems in which people spend most of their time. For scientific, ethical, and pragmatic reasons, it is important to study problems and experiences from system development. Systems analysis, ergonomics, human factors and frame of reference are discussed. Transl. by A.R.H.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N82-22875* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CERVIX-TO-RECTUM MEASURING DEVICE IN A RADIATION APPLICATOR FOR USE IN THE TREATMENT OF CERVICAL CANCER Patent
David R. Fischell (Howard Univ.) and Jeffrey C. Mazique, inventors (to NASA) (Howard Univ.) Issued 13 Oct. 1981 5 p Filed 12 May 1977 Supersedes N77-26796 (15 - 17, p 2306) Continuation of abandoned US Patent Appl. SN-672209, filed 31 Mar. 1976 Sponsored by NASA
(NASA-Case-GSC-12081-2; US-Patent-4,294,264; US-Patent-Appl-SN-796258; US-Patent-Appl-SN-672209; US-Patent-Class-128-778; US-Patent-Class-128-1.2; US-Patent-Class-33-143C) Avail: US Patent and Trademark Office CSCL 06B

A cervix-to-rectum measuring device to be used in the treatment of cervical cancer is described. It includes a handle and a probe pivotably connected to the handle for insertion in the rectum. The measuring device further includes means for coupling the handle to an intrauterine radiation applicator when the latter is positioned in the uterine cervix and the probe is inserted in the rectum to pivot the handle about the probe. A gear is provided which is adapted to pivot with the probe. A pinion pivotably connected to the handle meshes with the gear. A pointer fixed to the pinion is displaced in response to the pivoting of the handle about the probe, and this displacement

can be read from a scale on the handle, providing an indication of the cervix-to-rectum distance.

Official Gazette of the U.S. Patent and Trademark Office

N82-22876 Pennsylvania State Univ., University Park.
HEAT-ACTIVATED SWEAT GLAND DENSITIES DETECTED THROUGH MACROPHOTOGRAPHY IN LEAN AND OBESE MEN EXPOSED TO A WARM, HUMID ENVIRONMENT Ph.D. Thesis
James Alexander Bell 1981 172 p
Avail: Univ. Microfilms Order No. 8129140

Heat-activated sweat gland (HASG.cm-2) densities were quantified in lean and obese men to determine whether a significant inverse correlation between HASG and body surface area could be demonstrated. Heat exchange rates were also examined to determine if the heat exchange capacity of the obese is compromised due to fewer HASG. Twelve inactive men were divided into three equal groups. HASG were measured using a macrophotographic technique at four skin sites: forearm, chest, back, and thigh. Methacholine, a synthetic choline derivative biochemically similar to acetylcholine and synergistic to its action, was injected intradermally to ascertain maximal sweat gland activation. Other variables measured included skin and subcutaneous temperatures, rectal and esophageal core temperatures, heart rate, blood pressure, local and total body sweat rates, metabolic rate, and evaporation rate using an evaporimeter. HASG densities were not significantly different among the three groups. Dissert. Abstr.

N82-22877* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CUMULATIVE INDEX TO THE 1981 ISSUES
Jan. 1982 285 p
(NASA-SP-7011(228); NAS 1.21:7011(228)) Avail: NTIS HC $11.00 CSCL 06E

The aeromedical research reported considers the safety of the human component in manned space flight. The effects of spacecraft environment, radiation and weightlessness on human biological and psychological processes are covered. R.J.F.

N82-22878# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
AERODYNAMIC FORCES EXPERIENCED DURING EJECTION
Arthur J. Nestle Feb. 1981 12 p refs
(AF Proj. 7231)
(AFAMRL-TR-80-16) Avail: NTIS HC A02/MF A01

Emergency egress exposes aircrew members to abrupt accelerative and windblast forces. For the time period January 1967 to December 1977, 399 ejections were made from the F-4 aircraft. Forty-three aircrewmen sustained 95 long bone and joint injuries. Of this number, 39 were identified as upper and 22 as lower extremity injuries. The region, nature, and severity of long bone and joint injuries resulting from aircraft ejection are identified. Known biomedical data on bone and joint strength were reviewed. T.M.

N82-22879# Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
ANALYSIS OF VERTEBRAL STRESS DISTRIBUTIONS AND EJECTION-RELATED INJURY MECHANISMS Final Technical Report, 1 Jul. 1977 - Jan. 1980
M. Plesha and T. Belytschko Wright-Patterson AFB, Ohio AFAMRL Feb. 1981 51 p refs
(Contract F33615-77-C-0526)
(AD-A098639; AFAMRL-TR-80-67) Avail: NTIS HC A04/MF A01

Stress analyses of lumbar vertebrae were performed by a three dimensional finite element method for the purposes of evaluating simplified models of the vertebrae which are suitable as injury postprocessors, and gaining a better understanding of injury mechanisms. The finite element analyses were linear and elastic. Axial and moment loads were applied over the end plates to simulate G(Z) impact and on the facets to simulate load transmission between the articular facets and the vertebral bodies. The finite element model predicts that the maximum stresses under axial load are perpendicular to the axis of the vertebral body, which are called axial stresses; this is consistent with the predominance of compressive and wedge fractures. However, the maximum stresses predicted by the finite element model are only about a third of those predicted by the simplified injury model. This discrepancy is due to the fact that a substantial portion of the total load is transmitted through the vertebral centrum which is neglected in the simplified model. S.L.

N82-22880# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Environmental Medicine Div.
EFFECTS OF WHOLE AND PARTIAL BODY EXPOSURE TO DRY HEAT ON CERTAIN PERFORMANCE MEASURES
John F. Courtright May 1981 63 p refs
(AD-A100305; AFAMRL-TR-80-43) Avail: NTIS HC A04/MF A01

The effects on four performance measures of air of 65.6 C when the head was cooled with air of 15.6 C and without head cooling, were evaluated. Six subjects were exposed for 66 minutes to these environmental stressors and to two benign control tests. Humidity for all tests was maintained at 10 mm Hg partial water vapor pressure. The performance measures were mental arithmetic accuracy, choice reaction time, position compensation tracking, and rate compensation tracking. The tasks were presented in a repeating sequence throughout preexposure and exposure tests. Performance on all tasks showed the effects of the passage of time related to the gradual onset of fatigue. Preexposure reaction time performance and rate compensation tracking were better in the afternoon than in the morning. Performance on all tasks except position compensation tracking was influenced by differences in subject arousal level as indicated by body temperature measurements. The relationship between arousal level and reaction time stimulus information level was particularly pronounced. S.L.

N82-22881# National Mechanical Engineering Research Inst., Pretoria (South Africa). Special Projects Div.
DEVELOPMENT OF THE CARBON FIBRE POLYSULPHONE TOGGLE FOR LIGAMENT REPAIR OPERATIONS
M. S. Hunt May 1981 14 p ref
(CSIR-ME-1709; ISBN-0-7988-14764) Avail: NTIS HC A02/MF A01

The selection of a simple kinked bar design, the toggle, for ligament repair operations was examined. The ligament repair operations are often carried out by using carbon fiber. The carbon fiber tows pass through a hole drilled in the bone so that they can be attached to the bone on its outer surface. The attachment can be done with a bollard and a number of successful operations have used this technique. A second hole is drilled adjacent to the hole through the bone but just deep enough for the insertion of the bollard and allows one or more tows to be attached in this way. In practice the carbon fiber tow used for the ligament is doubled over on itself once or twice to give increased strength. This creates a loop at one end of the ligament and allows a much simpler method of attachment based on the use of the one hole only. Possibilities are studied which explore the possibilities of retaining both simplicity and security. E.A.K.

N82-22882# Rolls-Royce Ltd., Derby (England).
ANALYSIS OF SICKNESS RATES
Dieter Schittek 1981 23 p refs Transl. into ENGLISH from Fortschrittliche Betriebsfuhrung u. Ind. Eng. (West Germany), v. 29, no. 5, 1980 p 247-252 In ENGLISH and GERMAN
(PNR-90097; Trans-15573/TLT-00819) HC A02/MF A01

The unexpectedly high absenteeism in West Germany during an economic recession is discussed. The literature indicates Work content, worker expectations, management methods, performance assessment techniques, and degree of personal responsibility affect psychosomatic illness rates. Psychological factors are suggested as the cause of increases in somatic illness, since physiological stresses show a downward trend. Sociological influences are also important; lower tolerance of frustration and growing sensitivity to working conditions increase the probability that illness will occur as an abreaction of the unconscious arousal complexes to which dissatisfaction can give rise. Managers who place the responsibility for industrial relations on medical and social welfare experts are criticized. Managers should ensure that tasks challenge individuals' knowledge, skill, and experience,

and that workers are divided into groups whose members work well together. Author (ESA)

N82-22883# European Space Agency, Paris (France).
MICROGRAVITY AS AN ADDITIONAL TOOL FOR RESEARCH IN HUMAN PHYSIOLOGY: SIMULATION ON GROUND; EXPOSURE TO WEIGHTLESSNESS; DEVELOPMENT OF MULTI-USER FACILITIES
Flemming Bonde-Petersen (Copenhagen Univ.), Helmut Hinghofer-Szalkay (Graz Univ.), and Jerry Hordinsky (DFVLR, Cologne) Jan. 1982 55 p refs
(Contract ESA-81/86-076-HUPHYS)
(ESA-BR-09; ISSN-0250-1589) Avail: NTIS HC A04/MF A01; ESA, Paris FF 60 Member States, AU, CN and NO (+20% others)

Micro-g cardiovascular and pulmonary studies are summarized. A plan for coordinating European ground based micro-g simulation studies is presented. A multiuser facility for ground use which can be transformed into a space qualified facility is described. Difficulties in micro-g simulation include: the impossibility of equalizing hydrostatic pressure in the circulatory system; equalizing lung perfusion; recreating the subjective feeling of weightlessness; skin maceration in water; increased diuresis; and negative pressure breathing. Standardization of experiments is hindered by the interlaboratory variety of: measuring methods; simultaneous countermeasures; subjects; positioning, support, diet, and hydration of subjects; and temperature influences. A ground based model of Anthrorack, supplemented with a microcomputer and bus system interfaced with standard testing and measuring equipment, is suggested as a means of overcoming these problems. Author (ESA)

N82-23110*# Kentucky State Univ., Frankfort. Dept. of Biology.
CARDIOVASCULAR ADAPTATIONS IN WEIGHTLESSNESS: THE INFLUENCE OF IN-FLIGHT EXERCISE PROGRAMS ON THE CARDIOVASCULAR ADJUSTMENTS DURING WEIGHTLESSNESS AND UPON RETURNING TO EARTH
Charles H. Bennett *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 37 p refs (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 06S

N82-23134*# Virginia Univ., Charlottesville.
OPTIMAL USE OF ELECTROPHYSIOLOGICAL INDICATORS OF MUSCULAR EFFORT AND FATIGUE Final Report
Otis L. Updike *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 15 p refs (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 06S

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N82-22884# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Flugzeuge.
ANALYSIS OF PILOT INPUT CONCEPTS AND DEVICES INTO INTEGRATED DISPLAY/CONTROL SYSTEMS
Ruediger Seifert 21 Apr. 1981 21 p refs Presented at 32nd AGARD Symp. on the Impact of New Guidance and Control Systems on Military Aircraft Cockpit Design, Stuttgart, 5-8 May 1981
(MBB-FE-301/S/PUB/40) Avail: NTIS HC A02/MF A01

The concept of integrated display/control systems is addressed with emphasis on ergonomic requirements. Keyboard types, numeric input devices and positioning devices are discussed. Data handling concepts and layout criteria for fighter aircraft are also evaluated. J.M.S.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N82-22885 Admiralty Marine Technology Establishment, Teddington (England).
PERSONALISED TASK REPRESENTATION: DEVELOPMENTS
R. Gregory Oct. 1981 21 p refs
(AMTE(E)-TM-81104; BR81584) Copyright. Avail: Issuing Activity

The logic underlying personalized task representation (PTR) and with the hermeneutical roots from which it grew are described. A central action node is encircled by when, why, how, and what next nodes. The what next node leads to the next action node. It is used for knowledge representation and the design of intelligent support systems. The logical relations of PTR are expressed in terms of a frame methodology as a step towards implementation of a PTR based system for the elicitation and representation of task knowledge. By anchoring subsequently elicited representations in task dependent primitives, the system potential for machine execution of the representations can be realized. Author (ESA)

N82-22886*# ACCORD, Los Altos, Calif.
APPLICATION OF GUIDED INQUIRY SYSTEM TECHNIQUE (GIST) TO CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEMS (CELSS) Final Report
Henry Aroeste Jan. 1982 23 p
(NASA Order A-827058B; NASA Order A-89697B)
(NASA-CR-166312; NAS 1.26:166312) Avail: NTIS HC A02/MF A01 CSCL 06K

Guided Inquiry System Technique, a global approach to problem solving, was applied to the subject of Controlled Ecological Life Support Systems (CELSS). Nutrition, food processing, and the use of higher plants in a CELSS were considered by a panel of experts. Specific ideas and recommendations gleaned from discussions with panel members are presented. Author

N82-22887# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
THE INVERSE DYNAMICS OF THREE-DIMENSIONAL HOMINOID MOTION
H. Hatze Jun. 1981 37 p refs
(CSIR-SWISK-24; ISBN-0-7988-2127-2) Avail: NTIS HC A03/MF A01

Methods used for solving the inverse dynamics problem of three dimensional hominoid motion are described, and a user guide for the efficient implementation of the corresponding computer program is included. Kinetic and kinematic quantities used to solve the problem include: the internal joint torque vectors that generated the observed motion, the joint reaction force vectors, the linear and angular momentum vectors of the segments and the whole system, the mechanical energies of the segments and the whole system, the mechanical powers of the segments and the whole system, the position vector of the hominoid mass centroid, and the velocity vector of the hominoid mass centroid. S.L.

N82-22888# Research Inst. of National Defence, Umea (Sweden). Huvudavdelning 4.
STUDY OF PROTECTIVE MASK TYPE 33 [OEVERSYN AV SKYDDSMASK TYP 33]
Roger Sundqvist Apr. 1981 25 p In SWEDISH
(FOA-C-40134-C2) Avail: NTIS HC A02/MF A01

A functional evaluation of protective mask type 33 was made. The mask did not comply with civilian standards because the measured CO2 concentration was too high and the exhalation resistance needed to be lowered. Both factors are considered important for user's comfort and could easily be improved. The facial rim was not flexible enough to conform to different facial shapes, wrinkles or beards. The mask design could be significantly improved by changing its shape; this would necessitate retooling the mold. Some simple modifications of the present tools which could improve the mask's performance are discussed. M.D.K.

N82-22889# Research Inst. of National Defence, Stockholm (Sweden).
RECOGNITION OF VEHICLE TARGETS FROM THE AIR: A FIELD TEST [IDENTIFIERING AV FORDONSMAAL FRAAN LUFTEN ETT FAELTFOERSOEK]
Bjoern Norlin Nov. 1981 25 p refs In SWEDISH
(FOA-C-56027-H2) Avail: NTIS HC A02/MF A01

The distances at which a previously detected vehicle target can be identified was determined. The flight height was 100 m and the speed of the aircraft 190 Km/hr. Six persons without any experience in reconaissance identified five vehicles with a virtually constant accuracy of 70% regardless of the distance. The length of the checked interval was 1 to 4.5 Km, but most of the answers were given at 2.5 Km from the target. Other factors than distance influence on identification performance, indicating that the test persons used other decision making criteria. Author (ESA)

N82-23109*# Texas Southern Univ., Houston. Medical Research Branch.
EXPERIMENTAL STUDY OF HIGH DENSITY FOODS FOR THE SPACE OPERATIONS CENTER Final Report
Selina M. Ahmed *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 22 p refs (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 06H

N82-23115*# Houston Univ., Tex.
ANTHROPOMETRIC DATA ERROR DETECTING AND CORRECTION WITH A COMPUTER
David D. Chesak (St. Joseph's College) *In its* The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 12 p refs (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 05H

N82-23124*# Houston Univ., Tex.
ANTHROPOMETRIC PROGRAM ANALYSIS OF REACH AND BODY MOVEMENT Final Report
Charles J. McKinley *In its* The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 16 p refs (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 05H

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N82-22890*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN EVALUATION OF SUPERMINICOMPUTERS FOR THERMAL ANALYSIS
Olaf O. Storaasli, James B. Vidal, and Gary K. Jones Apr. 1962 18 p refs Presented at NASA Symp. on Computational Aspects of Heat Transfer in Structures, Hampton, Va., 3-5 Nov. 1981 Submitted for publication
(NASA-TM-83284; L-15273; NAS 1.15:83284) Avail: NTIS HC A02/MF A01 CSCL 09B

The feasibility and cost effectiveness of solving thermal analysis problems on superminicomputers is demonstrated. Conventional thermal analysis and the changing computer environment, computer hardware and software used, six thermal analysis test problems, performance of superminicomputers (CPU time, accuracy, turnaround, and cost) and comparison with large computers are considered. Although the CPU times for superminicomputers were 15 to 30 times greater than the fastest mainframe computer, the minimum cost to obtain the solutions on superminicomputers was from 11 percent to 59 percent of the cost of mainframe solutions. The turnaround (elapsed) time is highly dependent on the computer load, but for large problems, superminicomputers produced results in less elapsed time than a typically loaded mainframe computer. S.L.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N82-22891*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GENERIC FUNCTIONAL REQUIREMENTS FOR A NASA GENERAL-PURPOSE DATA BASE MANAGEMENT SYSTEM
Guy M. Lohman 1 Oct. 1981 86 p refs
(Contract NAS7-100)
(NASA-CR-168820; JPL-Pub-82-6; NAS 1.26:168820) Avail: NTIS HC A05/MF A01 CSCL 09B

Generic functional requirements for a general-purpose, multi-mission data base management system (DBMS) for application to remotely sensed scientific data bases are detailed. The motivation for utilizing DBMS technology in this environment is explained. The major requirements include: (1) a DBMS for scientific observational data; (2) a multi-mission capability; (3) user-friendly; (4) extensive and integrated information about data; (5) robust languages for defining data structures and formats; (6) scientific data types and structures; (7) flexible physical access mechanisms; (8) ways of representing spatial relationships; (9) a high level nonprocedural interactive query and data manipulation language; (10) data base maintenance utilities; (11) high rate input/output and large data volume storage; and adaptability to a distributed data base and/or data base machine configuration. Detailed functions are specified in a top-down hierarchic fashion. Implementation, performance, and support requirements are also given. M.G.

N82-22892*# Idaho Univ., Moscow. Dept. of Electrical Engineering.
CONTROL STRUCTURES FOR HIGH SPEED PROCESSORS
Gary K. Maki, Robb Mankin, Patrick A. Owsley, and Guihang Moon Kim [1982] 12 p refs Proposed for presentation at the IEEE 1982 Intern. Conf. on Parallel Processing
(Grant NAG5-93)
(NASA-CR-168771; NAS 1.26:168771) Avail: NTIS HC A02/MF A01 CSCL 09B

A special processor was designed to function as a Reed Solomon decoder with throughput data rate in the Mhz range. This data rate is significantly greater than is possible with conventional digital architectures. To achieve this rate, the processor design includes sequential, pipelined, distributed, and parallel processing. The processor was designed using a high level language register transfer language. The RTL can be used to describe how the different processes are implemented by the hardware. One problem of special interest was the development of dependent processes which are analogous to software subroutines. For greater flexibility, the RTL control structure was implemented in ROM. The special purpose hardware required approximately 1000 SSI and MSI components. The data rate throughput is 2.5 megabits/second. This data rate is achieved through the use of pipelined and distributed processing. This data rate can be compared with 800 kilobits/second in a recently proposed very large scale integration design of a Reed Solomon encoder. R.J.F.

N82-22893*# McDonnell-Douglas Astronautics Co., Huntsville, Ala. Avionics, Control and Information Systems.

SPACELAB PROGRAM: CONVERSION OF SPACELAB TO PACKET DATA FORMAT. FLIGHT SYSTEM STUDY Final Report
Sep. 1981 120 p
(Contract NAS8-32350)
(NASA-CR-161997; NAS 1.26:161997; MDC-G8371) Avail: NTIS HC A06/MF A01 CSCL 09B

A study of packetization of the Spacelab data handling system, including the alternate approaches considered and the supporting rationale, is described. It is concluded that it is well within today's state of the art in microelectronics to implement either a full or hybrid packet data system on board the Spacelab. Of the two, the hybrid system is preferred because of the significant cost saving. L.F.M.

N82-22894*# Illinois Univ., Urbana. Aeronomy Lab.
IMPLEMENTATION OF CONTEXT INDEPENDENT CODE ON A NEW ARRAY PROCESSOR: THE SUPER-65
R. O. Colbert and S. A. Bowhill 1 Jun. 1981 104 p refs Sponsored in part by National Science Foundation
(Grant NSG-7506)
(NASA-CR-168797; NAS 1.26:168797; AR-97;
ISSN-0568-0581) Avail: NTIS HC A06/MF A01 CSCL 09B

The feasibility of rewriting standard uniprocessor programs into code which contains no context-dependent branches is explored. Context independent code (CIC) would contain no branches that might require different processing elements to branch different ways. In order to investigate the possibilities and restrictions of CIC, several programs were recoded into CIC and a four-element array processor was built. This processor (the Super-65) consisted of three 6502 microprocessors and the Apple II microcomputer. The results obtained were somewhat dependent upon the specific architecture of the Super-65 but within bounds, the throughput of the array processor was found to increase linearly with the number of processing elements (PEs). The slope of throughput versus PEs is highly dependent on the program and varied from 0.33 to 1.00 for the sample programs. Author

N82-22895*# Michigan Univ., Ann Arbor. Dept. of Electrical and Computer Engineering.
CLOSED-FORM SOLUTIONS OF PERFORMABILITY
J. F. Meyer [1982] 30 p refs
(Grant NsG-1306)
(NASA-CR-168835; NAS 1.26:168835) Avail: NTIS HC A03/MF A01 CSCL 09B

It is noted that if computing system performance is degradable then system evaluation must deal simultaneously with aspects of both performance and reliability. One approach is the evaluation of a system's performability which, relative to a specified performance variable Y, generally requires solution of the probability distribution function of Y. The feasibility of closed-form solutions of performability when Y is continuous are examined. In particular, the modeling of a degradable buffer/multiprocessor system is considered whose performance Y is the (normalized) average throughput rate realized during a bounded interval of time. Employing an approximate decomposition of the model, it is shown that a closed-form solution can indeed be obtained. M.G.

N82-22896# Royal Aircraft Establishment, Farnborough (England).
AN IMPLEMENTATION OF MIL-STD-1750 AIRBORNE COMPUTER INSTRUCTION SET ARCHITECTURE
S. J. Shrimpton May 1981 151 p refs
(RAE-TM-FS-403; BR80502) Avail: NTIS HC A08/MF A01

The design of a processor using Advanced Micro Devices (AMD) 2901 bit slice microprocessor devices is described. The aspects of the hardware design and microcode specific to Mil Std-1750 are discussed and reviewed in light of operating experience. A full listing of the AMDASM micro assembler definition file and microcode source text is included, together with full hardware documentation. The processor has two system 29 prototyping boards. The arithmetic unit, general registers, memory, input/output control logic, interrupt system, and the CPU control box push button implementation logic are on CPU-1. The control unit which provides during each microcycle the microcode work whose individual bits control all the other sections of the processor are on CPU-2. Author (ESA)

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N82-22897*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ON THE INVERSION OF BLOCK TRIDIAGONALS WITHOUT STORAGE CONSTRAINTS
Marshal L. Merriam Mar. 1982 25 p refs
(NASA-TM-84228; A-8848; NAS 1.15:84228) Avail: NTIS HC A02/MF A01 CSCL 09B

A strategy was developed to permit trade-offs between the number of floating point operations required and the storage requirements for the solution of certain difference problems, such as block tridiagonal systems of equations. This is done by recomputing some intermediate results instead of storing them. Reducing the storage to the square root of the current requirement roughly doubles the number of computations. Reducing the storage more than this tends to make the number of computations prohibitively large. In theory, if m is the order of each sub-matrix in the block tridiagonal matrix, one can solve any linear system with only $5m(2) + 1$ temporary storage cells. In many cases m is a constant and quite small. For example, in solving a factored form of the three-dimensional Navier-Stokes equations, the size m of the block tridiagonals is 5. This method lends itself to efficient use on computers with parallel processing or vector processing architectures. On these computers the larger number of floating point operations is more than offset by the decrease in I/O and the increased percentage of vector operations made possible by this algorithm. M.G.

N82-22898# Centre d'Etudes et de Recherches, Toulouse (France). Dept. d.Informatique-Automatique.
DEVELOPMENT OF SOFTWARE FOR COMPUTER AIDED DESIGN POWER REGULATORS Final Report [DEVELOPMENT D'UN LOGICIEL DE CAO DE REGULATEURS DE PUISSANCE]
M. Clique, J. Foisseau, and A. J. Fossard Feb. 1979 55 p refs In FRENCH
(Contract ESTEC-3309/77/NK-AK)
(CERT-3/3102-DERI; CERT-5/7139-DERA; ESA-CR(P)-1241) Avail: NTIS HC A04/MF A01

An interpretive computer programming language ESAU for analyzing high tension electrical power regulators using FORTRAN is described. The user's manual documenting the language is presented. Input formats, flowcharts, and descriptions of functions performed by program modules are discussed. Author (ESA)

N82-22899# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
PROGRAMMER HANDBOOK FOR PROGRAM BUNDLES IN FILE MAINTENANCE [PROGRAMMERARHANDBOK FOER PROGRAMPAKETET FILREGISTER]
Lars-Aake Larsson Apr. 1981 168 p In SWEDISH
(FOA-C-20403-D8) Avail: NTIS HC A08/MF A01

In many dialog oriented computer applications it is vital to keep track of data quantities. The computer keeps track of this through it's filing system but it is often necessary to have knowledge of the data and it's organization. Often it is difficult to write a program that will search the file from within an applications program and it can be difficult for a noncomputer oriented person to understand. FILEREGISTER is a program built on the DAPU system for handling program bundles. It can combine an arbitrary application program written into the program SIMULA. FILEREGISTER of the program MENYDIALOGSYSTEM, which supports menue handling, command interpretation and text handling. J.M.S.

N82-22900# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
NYCOND, AN AMENDMENT TO CONDIS [NYCOND, EN

OMARBETNING AV CONDIS]
Aug. 1981 110 p refs In SWEDISH
(FOA-C-20419-E3) Avail: NTIS HC A06/MF A01

Changes in the NYCOND simulation program for use on the DEC-10 system at Stockholms Datamaskin central QZ are described, and it is compared with the CONDIS program. Both programs are based on COMBINEDSIMULATION, but NYCOND is based on a newer version than is CONDIS. The NYCOND program provides a numerical method of solving differential equations. Both program structure and the dialog have been changed from CONDIS. A subclass of NYCOND, called CLASS vekcon, allowing the direct use of vectors and vector equations in the system definition, is also described. J.D.

N82-22901# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
FURTHER INVESTIGATIONS ON SOFRAM: PROGRESS REPORT 2 Progress Report [FORTSATTA STUDIER KRING SOFRAM, DELRAPPORT 2]
Ralf Eliasson Sep. 1981 40 p refs In SWEDISH
(FOA-C-20424-D3) Avail: NTIS HC A03/MF A01

Improvement of the combustion efficiency of a solid fuel ramjet motor (SOFRAM) by redesign of the shape of the combustion chamber is described. A tubular fuel having an inner diameter of 100 mm was employed. The specific impulse and combustion velocity of polyethane and HTPB are compared. Water tunnel tests are surveyed. Performance for different entrance conditions corresponding to speeds of Mach 1.7-2.0 is described. Test results are applied as basic data for the design of a heavy antitank robot. Transl. by J.D.

N82-22902# Research Inst. of National Defence, Umea (Sweden). Huvudavdelning 4.
FORTRAN PROGRAM FOR ELLIPSOMETER MEASUREMENTS [FORTRANPROGRAM FOER ELLIPSOMETERAETNING]
Stefan Sollander and Goeran Olofsson Feb. 1981 50 p refs In SWEDISH
(FOA-C-40130-C2) Avail: NTIS HC A03/MF A01

A data program for adapting ellipsometer measurements is described. The program calculates the reflective index or the thickness of thin single or multiple layered films. In order to be compatible with a digital VAX/VMS system, the program is written in FORTRAN. J.D.

N82-22903# Research Inst. of National Defence, Linkoeping (Sweden).
MARR/HILDRETH MODEL FOR EDGE DETECTION IN AN IMAGE: CHOICE OF A PROGRAM SYSTEM [MARR/HILDRETH MODELLEN FOER DETEKTERING AV KANTER I EN BILD FRAMTAGNING AV ETT PROGRAMSYSTEM]
Kristina Ernstsson, Carl-Hedic Hedin, and Sten Nyberg Oct. 1981 64 p refs In SWEDISH
(FOA-C-30235-E1) Avail: NTIS HC A04/MF A01

A systems program for improving the performance of the Marr/Hildreth model by reducing the number of edge spots due to noise in the original image and the shadow effects from the Marr operator is described. Methods for elimination of parallel edges, caused by a continuous modification in image intensity are evaluated. Three methods were considered: horizontal reduction, vertical reduction, and thinning down of the edge. Programmed instructions were formulated, required that the neighboring spots in the edge have approximately the same direction and magnitude in order to be considered real edge spots. Another threshold was a minimum of edge darkness, for avoiding noise and shadow spots. The best results are obtained by a combination of horizontal and vertical reduction.
Author (ESA)

N82-22904# Stichting Mathematisch Centrum, Amsterdam (Netherlands).
RECENT DEVELOPMENTS IN DETERMINISTIC SEQUENCING AND SCHEDULING: A SURVEY
E. L. Lawler (California Univ., Berkeley), J. K. Lenstra, and A. H. G. RinnooyKan (Erasmus Univ.) Aug. 1981 42 p refs Submitted for publication
(Grant NSF MCS-78-20054)
(MC-BW-146/81) Avail: NTIS HC A03/MF A01

The state of the art with respect to optimization and approximation algorithms, interpreted in terms of computational complexity theory is surveyed. Single machine scheduling; identical, uniform and unrelated parallel machine scheduling; and open shop, flow shop and job shop scheduling are considered. The success of complexity theory as a means of differentiating between easy and hard problems emerges within the very detailed problem classification presented. Elementary reductions are defined that can be used in order to deduce the consequences of the development of a new polynomial time algorithm or an NP hardness proof. The area of deterministic sequencing and scheduling is shown to be one of the more fruitful interfaces between computer science and operations research.
Author (ESA)

N82-22905# Forschungsinstitut fuer Informationsverarbeitung, Karlsruhe (West Germany).
STUDY OF MULTIPROCESSOR STRUCTURES FOR IMAGE PROCESSING Final Report
Peter Gemmar and Faustino Palomino Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 191 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-DV-81-008; ISSN-0170-9011) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 19,30

A basis for the development of processing structures which requires different picture processing operations was determined. Actual systems are only optimized for special types of picture processing operations and do not significantly reduce the total run time of complex operations which need many requirements. A general multiprocessor structure for picture processing was designed. With this system the advantageous execution of complex picture processing operations is achieved by parallel processing on a functional level. Every processor is equipped with a special unit to efficiently deal with the traffic of data to and from the computing unit. Author (ESA)

N82-22906# Rolls-Royce Ltd., Derby (England).
COMPUTER ANALYSIS OF DIFFRACTION PATTERN PHOTOGRAPHS OBTAINED USING THE LAUE METHOD
Jean-Pierre Riquet and Roland Bonnet Feb. 1981 9 p refs Transl. into ENGLISH from J. of Appl. Cryst. (France) v. 12, 1979 p 39-41 Partly in ENGLISH and FRENCH
(PNR-90096; Trans-15549/TLT-00816) Avail: NTIS HC A02/MF A01

A computation method which allows rapid indexing of any unknown spot pattern obtained by back reflection or transmission Laue methods is presented. The Cartesian coordinates of n spots are measured in an orthonormal frame referred to the photographic film. Two spots 1 and 2 separated by a wide angular distance alpha sup m are chosen. Their indices are assumed to be < 5. The set (E) of all the pairs of planes (h sub 1 k sub 1 l sub 1) and (h sub 2 k sub 1 l sub 2) making an angle close to alpha sup m is then computed. Since the pair of reflecting planes related to spots 1 and 2 belongs to (E), each computed pair of planes is tried in order to determine the orientation of the crystal and to check whether the coordinates of the (n-2) other spots can be matched to dense planes of indices < 8. If the uncertainty of the measurements is high, or if n is too low, this method gives the possible orientations for the crystal. Plane indices < 8 are identified in cubic, tetragonal and orthorhombic crystals. Author (ESA)

N82-22907# AEG-Telefunken, Heilbronn (West Germany). Geschaeftsbereich Elektronische Bauelemente.
INTEGRAL COMPUTER AIDED DESIGN (CAD) PROCEDURES FOR COMPLEX MOS SYSTEMS Final Report, Feb. 1979
Uwe Jaeger and Wilfried Jud Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 87 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-213; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 18,30

Software for a digital integral logic and fault simulation system, including a descriptive language, was developed and implemented.

The modification and updating of existing computer aided design systems for MOS-LSI was envisaged. Automatic layout verification and circuit recognition of a MOS network from the topography of its mask were also considered. An electron beam exposure system was studied. As a design rule check, test circuits were characterized. Results show the value of the integral simulation and layout verification programs as tools for efficient LSI, or even VLSI, circuit design. Author (ESA)

N82-22908# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
TOWARDS MONOLINGUAL PROGRAMMING ENVIRONMENTS
Jan Heering and Paul Klint Dec. 1981 30 p refs Submitted for publication
(MC-IW-185/81) Avail: NTIS HC A03/MF A01

The excessive complexity of most programming environments is discussed. One way of simplifiying them is to reduce the number of mode dependent languages the user has to be familiar with. As a first step towards this end the feasibility of unified command/programming/debugging languages and the concepts on which such languages have to be based were investigated. The unification process is accomplished in two phases. First, a unified command/programming framework is defined and, secondly, this framework is extended adding an integrated debugging capability to it. Strict rules are laid down by which to judge language concepts that present themselves as candidates for inclusion in the framework during each phase. On the basis of these rules, many of the language design questions that need to be resolved this way or that depend on the taste of the designer lose their vagueness and can be decided in an unambiguous manner. Author (ESA)

N82-22909# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
A FORMALIZED PROOF SYSTEM FOR TOTAL CORRECTNESS OF WHILE PROGRAMS
J. A. Bergstra and J. W. Klop (Stichting Mathematische Centrum) Oct. 1981 19 p refs Submitted for publication
(MC-IW-175/81) Avail: NTIS HC A02/MF A01

Data specifications based on schemes which are a slight generalization of first order specifications are introduced. For a schematic specification (Sigma, the set of all E), Hoare's Logic HL (Sigma, the set of all E) for partial correctness is defined as usual. A proof system (Sigma, the set of all E) assertion sign p tends to the limit S tends down to the limit for termination assertions is defined. Completeness with reference to second order semantics is proven. A translation of a standard proof system HL sub T(A) for total correctness on a structure A into this format is provided. Author (ESA)

N82-22910# Leiden Univ. (Netherlands). Dept. of Computer Science.
PROVING PROGRAM INCLUSION USING HOARE'S LOGIC
J. A. Bergstra and J. W. Klop (Stichting Mathematische Centrum) Oct. 1981 63 p refs Submitted for publication
(MC-IW-176/81) Avail: NTIS HC A04/MF A01

Program equivalence with reference to Hoare's logic for program correctness is studied. Conservative refinements of specifications having a criterion and a characterization of conservativeness and Robinson's consistency theorem are explored. Axiomatic semantics for programs are stressed. These form an appropriate framework for a proof theory for program inclusion based on a proof theory for program correctness. Two formalized proof methods for program inclusion are proposed and proven sound. Both methods are incomplete, but seem to cover most natural cases. Their novelty lies in the precise mathematical analysis of the situation and a rather strict adherence to first order proof systems and first order semantics for data type specifications. Semantic problems are minimized by working with 'WHILE' programs only; this by no means trivializes the results. Author (ESA)

N82-22911# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
MAKING ALGOL 68 + TEXTS CONFORM TO AN OPERATOR-PRIORITY GRAMMAR
L. G. L. T. Meertens and J. C. vanVliet Oct. 1981 27 p refs Submitted for publication
(MC-IW-180/8) Avail: NTIS HC A03/MF A01

A superlanguage of ALGOL 68, ALGOL 68+, which is powerful enough to describe the standard prelude is discussed. An operator precedence grammar can, through a simple right-to-left transduction scheme, be made to be of type LL(1). If, in addition, the grammar is an operator-priority grammar, an easy and consistent error recovery mechanism can be applied. An operator-priority grammar of ALGOL 68+ is cited. The main difference between this grammar and an underlying context free grammar of ALGOL 68+ is that (a) symbols represented by the same mark are distinguished, and (b) various symbols are inserted in the grammar. How these changes can be taken care of during the first phases of an ALGOL 68+ implementation is explained. Author (ESA)

N82-22912# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
LANGUAGELESS PROGRAMMING
A. vanWijngaarden Nov. 1981 15 p refs Submitted for publication
(MC-IW-181/81) Avail: NTIS HC A02/MF A01

To express an algorithm through a two level grammar with an ease comparable to, but by avoiding the use of an intervening programming language is demonstrated. A formal operational definition of 'two level grammar' is given. There are at least four levels of definition involved in the specification of a process to be performed on data: (1) the definition of the two level grammar by the algorithm designer; (2) the specific two level grammar of a language by the language designer; (3) the particular program in that language by the programmer; and (4) the output of that particular program by the computer. It is shown how (2) can be eliminated. A set of metarules and a set of hyperrules are given. These sets are regarded as a language, but there is an essential difference. The grammarian never writes down a representation of a terminal letter; these representations are equivalent with the output of (4) and eliminate the language. Author (ESA)

N82-22913# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
ON TOP-DOWN PARSING OF ALGOL 68+
L. G. L. T. Meertens and J. C. vanVliet Nov. 1981 22 p refs Submitted for publication
(MC-IW-182/81) Avail: NTIS HC A02/MF A01

A superlanguage of ALGOL 68, ALGOL 68+, which is powerful enough to describe the standard prelude is considered. If a grammar is of type LL(1), this easily leads to a parsing method for that grammar implemented by a set of mutually recursive routines, one for each nonterminal of the grammar. An operator precedence grammar for ALGOL 68+ can, through a simple right-to-left transduction scheme, be made to be of type LL(1). If, in addition, the grammar is an operator-priority grammar, an easy and consistent error recovery mechanism can be applied. Both the algorithm for the transduction scheme and the subsequent top-down syntax analysis are discussed with emphasis on the treatment of incorrect input texts. The LL(1) grammar for ALGOL 68+ is given as well. Author (ESA)

N82-23127*# Tennessee Technological Univ., Cookeville.
A FAST VARIABLE STEP SIZE INTEGRATION ALGORITHM SUITABLE FOR COMPUTER SIMULATIONS OF PHYSIOLOGICAL SYSTEMS Final Report
Larry Neal *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 14 p refs (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 09B

62 COMPUTER SYSTEMS

Includes computer networks.

N82-22914 International Institute for Applied Systems Analysis, Laxenburg (Austria)
THE ROLE OF THE TPA-70 GATEWAY NETWORK IN

PROMOTING TRANSBORDER DATA FLOW OF SCIENTIFIC INFORMATION IN AN INTERNATIONAL SETTING
A. Labadi and I. Sebestyen Aug. 1981 17 p refs
(IIASA-WP-81-122; IIASA-RR-81-18) Copyright. Avail: Issuing Activity

An on line computerized international scientific and technical information network is described. It consists of node computers performing the usual network functions and time division multiplexers. It is based in Austria and has links with Tymnet, Telenet, Euronet, RPCnet, and Russian and Hungrian networks. It provides concurrent terminal host communication, user user communication, user node operator communication, monitoring, remote training, saving of the traffic of any terminal, authorization control, day file (statistics) maintenance, and status reports. Author (ESA)

N82-22915*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADVANCEMENTS IN REAL-TIME ENGINE SIMULATION TECHNOLOGY
John R. Szuch 1982 12 p refs To be presented at the 18th Joint Propulsion Conf., Cleveland, 21-23 Jun. 1982 Sponsored in part by AIAA, SAE and ASME
(NASA-TM-82825; E-1177; NAS 1.15:82825) Avail: NTIS HC A02/MF A01 CSCL 21E

The approaches used to develop real-time engine simulations are reviewed. Both digital and hybrid (analog and digital) techniques are discussed and specific examples of each are cited. These approaches are assessed from the standpoint of their usefulness for digital engine control development. A number of NASA-sponsored simulation research activities, aimed at exploring real-time simulation techniques, are described. These include the development of a microcomputer-based, parallel processor system for real-time engine simulation. M.G.

N82-22916# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.
IMPLEMENTATION ASSESSMENT OF TRANSPORT AND NETWORK SERVICES
R. F. L. Henley Jul. 1981 87 p refs
(NPL-DNACS-46/81; ISSN-0143-7348) Avail: NTIS HC A05/MF A01

A test responder (TR) used in assessing high level protocol implementations is introduced for use in a global network service. The TR is implemented in the client's system and is specific to a given service. It can be used with International Standards Organization transport and network service standards. Filestores and real time clocks are not needed. An algorithm which facilitates TR implementation is provided as a flowchart. Also, function, features and behavior are described textually. When tailored to implementor needs, the TR can be used as a development aid, as well as a prerequisite of assessment testing. Encoding, buffering, and design considerations are outlined. Author (ESA)

N82-22917# Fraunhofer-Inst. fuer Informations- und Datenverarbeitung, Karlsruhe (West Germany).
COMPLETION AND PILOT TESTING OF A FAULT TOLERANT REAL TIME COMPUTER SYSTEM WITH DISTRIBUTED MICROCOMPUTERS: PILOT IMPLEMENTATION (REALLY DISTRIBUTED CONTROL (RDC) SYSTEM) Final Report, May 1981
Dirk Heger Bundesministerium fuer Forschung und Technologie Dec. 1981 254 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-DV-81-007; ISSN-0170-9011) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 41,90

The prototype RDC system was tested and the completeness of the hardware and software components were proven in practice by a pilot implementation. Features of the system include: distributed fault tolerant real time computer system with a fiber optic ring-bus system for industrial automation; modular design, central operating by means of an input-output color screen system (EAF); and complete programming by means of multicomputer PEARL. A stepwise upgraded pit furnace plant with 28 pit furnaces was selected as the pilot project. Experience was given in the following areas: reliability fault diagnosis; fault tolerance; fiber optics under environmental stress; traffic flow in the ring-bus system with decentralized control; digital drive and control of a real pit furnace process using the high level language PEARL; synchronization and interprocess communication with PEARL; use of a dynamic down line loader; application of a distributed operating system supporting multicomputer PEARL; adaption of the PEARL operating system to other computers; and distributed real time data bases. Author (ESA)

N82-22918# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
A FORMAL MODEL FOR DATA FLOW PROGRAMS WITH TOKEN COLORING
Arthur H. Veen Oct. 1981 28 p refs Submitted for publication
(MC-IW-179/81) Avail: NTIS HC A03/MF A01

A formal model is presented that is intended to be general enough to allow description of the execution of programs on different types of data flow computers, including those that use token coloring to separate activations of reentrant graphs. The model regards nodes and ports as basic domains and associates with each node a firing rule which fully defines the behavior of the node including, for each firing, the destinations of its output arcs. The behavior of nonfunctional and nondeterministic data flow instructions and the dynamic creation of data paths can be expressed in this model. It can be a useful vehicle for exploring semantic properties of data flow programs, including conditions that guarantee deadlock-free, conflict-free and deterministic execution, in the context of token coloring and dynamic data paths. The model is also used as a descriptive tool for a formal comparison of different data flow machines. Author (ESA)

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support*.

N82-22919# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
APPROXIMATIONS FOR THE WAITING TIME DISTRIBUTION OF THE M/G/c
M. H. vanHoorn and H. C. Tijms (Vrije Univ.) Jun. 1981 14 p refs Submitted for publication
(MC-BW-144/81) Avail: NTIS HC A02/MF A01

A stable recursive algorithm which approximates mean queue size (state probability) for the M/G/c queue is considered. Using this particular approximation for the queue size distribution, an accurate approximation for the waiting time distribution is developed under the assumption that service is in order of arrival. The integral equation to compute the approximate waiting times is derived. The result is given in the form of a defective renewal equation. This integral equation can be numerically solved by a simple recursion procedure. Asymptotic results for the waiting times are presented. Numerical results indicate that the approximations are sufficiently accurate for practical purposes. Author (ESA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N82-22920 Yale Univ., New Haven, Conn.
QUASI-NEWTON METHODS FOR LARGE SCALE NONLINEAR PROBLEMS Ph.D. Thesis
Trond Steihaug 1981 188 p
Avail: Univ. Microfilms Order No. 8126367

Quasi-Newton methods are well known iterative methods for solving nonlinear problems. At each stage, a system of linear equations has to be solved. However, for large scale problems, solving the linear system of equations can be expensive and may not be justified when the iterate is far from the solution of

when the matrix is an approximation to the Jacobian or Hessian matrix. Instead we consider a class of inexact Quasi-Newton methods which solves the linear system only approximately. We derive conditions for local and superlinear rate of convergence in terms of a relative residual. A major drawback of the methods is that they are only locally convergent. We imbed inexact Quasi-Newton in a global method based on a linesearch approach using a backtracking strategy, and method based on trust region. We show that the resulting methods are globally convergent under very weak conditions. We also derive a new family of sparse and symmetric matrix updates that satisfies the conditions for local and global convergence with a rate that is superlinear.
Dissert. Abstr.

N82-22921*# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.
THE STOKES PROBLEM FOR THE ELLIPSOID USING ELLIPSOIDAL KERNELS
Zhuowen Zhu Jun. 1981 24 p refs
(Grant NGR-36-008-161)
(NASA-CR-168787; NAS 1.26:168787; Rept-319) Avail: NTIS HC A02/MF A01 CSCL 12A

A brief review of Stokes' problem for the ellipsoid as a reference surface is given. Another solution of the problem using an ellipsoidal kernel, which represents an iterative form of Stokes' integral, is suggested with a relative error of the order of the flattening. On studying of Rapp's method in detail the procedures of improving its convergence are discussed. Author

N82-22922*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MULTIPLE-GRID ACCELERATION OF LAX-WENDROFF ALGORITHMS
Gary M. Johnson Mar. 1982 22 p refs
(NASA-TM-82843; E-1213; NAS 1.15:82843) Avail: NTIS HC A02/MF A01 CSCL 12A

A technique for accelerating the convergence of a one-step Lax-Wendroff method to a steady-state solution is discussed and its applicability extended to the more general class of two-step Lax-Wendroff methods. Several two-step methods which lead to quite efficient multiple grid algorithms are discussed. Computational results are presented using the full two dimensional Euler equations for both subcritical and shocked supercritical flows. Extensions and generalizations are mentioned. M.G.

N82-22923# Oak Ridge National Lab., Tenn. Computer Sciences Div.
MOMENT (SQUARE ROOT OF b SUB 1, b SUB 2) TECHNIQUES
K. O. Bowman and L. R. Shenton Aug. 1981 70 p refs
(Contract W-7405-eng-26)
(ORNL/CSD-83) Avail: NTIS HC A04/MF A01

Goodness of fit, based on the sample skewness and kurtosis in sampling from the normal or other distributions such as members of the Pearson system, are tested. Normal distributions is reviewed. Theoretical aspects of omnibus contours are discussed. N.W.

N82-22924# Oak Ridge National Lab., Tenn. Computer Sciences Div.
SOME EXTENSIONS OF AN ALGORITHM FOR SPARSE LINEAR LEAST SQUARES PROBLEMS
Michael T. Heath May 1981 25 p refs
(Contract W-7405-eng-26)
(ORNL/CSD-80) Avail: NTIS HC A02/MF A01

A solution method for sparse linear least squares problems which uses Givens rotation is reviewed. Several algorithms are developed which extent the method to include rank deficient problems, linear equality constrained problems, and updating of solutions. An application of these methods to the solution of sparse square nonsymmetric linear systems is also presented.
M.G.

N82-22925# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
SADDLE-POINT THEOREMS FOR RATIONAL APPROXIMATION
Jacob Flachs May 1981 35 p refs Presented at the Intern. Symp. on Semi-Infinite Programming and Appl., Austin, Tex., 8-10 Sep. 1981
(CSIR-TWISK-210) Avail: NTIS HC A03/MF A01

Rational approximation is considered where the functions involved are supposed to be continuous on a general compact set. With the aid of a Helly type theorem, the problem, viewed as a semiinfinite program, is reduced to an ordinary quasiconvex program. The reduced program, which is the above rational approximation discretized on a certain finite subset of the pact set, has the same value as the original problem, while its solution set, if nonvoid, includes that of the original problem. The solution of the original approximation, as well as the subset giving the reduced program, are expressed by saddle point statements in which a finite number of variables are involved. The solution set of the reduced problem is characterized, and necessary and sufficient conditions are given for the unicity of its solution. Also discussed is the problem of the minimum number of points for which the error reaches its greatest magnitude. M.G.

N82-22926 National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.
A CRITICAL EVALUATION OF VARIOUS METHODS FOR THE SOLUTION OF LAPLACE'S EQUATION
G. T. Symm Dec. 1981 27 p refs
(NPL-DNACS-54/81; ISSN-0143-7348) Avail: NTIS HC A03/MF A01

Methods of solving Laplace's equation for two dimensional problems are compared. Speed, storage requirements, and range of applications are considered. The methods are applied to the torsion problem for a square prism and to a mixed boundary value problem, involving an L-shaped domain with a rounded corner. The 9 point finite difference method is ideally suited only to problems in domains whose boundaries coincide with lines of a regular square mesh, although short sections of curved boundary can be accommodated by supplementing the method by 5 point formulas at neighboring mesh points. The integral equation method is the most easily applied to general domains and boundary conditions. Author (ESA)

N82-22927# Fondazione Ugo Bordoni, Rome (Italy).
APPROXIMATION IN (0, POSITIVE INFINITY) OF A POWER SERIES [APPROSSIMAZIONE IN (0, +00) DI UNA SERIE DI POTENZE]
Giancarlo Pesamosca Jul. 1981 11 p In ITALIAN
(FUB-12-1981) Avail: NTIS HC A02/MF A01

Approximation formulas of a power series are presented. The computation of these series is encountered in evaluating telephonic traffic density. The given approximation covers the whole interval (0 to positive infinity) with an error not > 1,2 x 10 to the -6 power. The series in terms of the parameter k is expressed: y(x) = the sum (k = 2 to positive infinity) e to the -x power, x to the k power/k factorial, log k factorial.
Author (ESA)

N82-22928# National Aerospace Lab., Amsterdam (Netherlands). Flight Dynamics Div.
REQUIREMENTS AND DEVELOPMENTS SHAPING A NEXT GENERATION OF INTEGRAL METHODS
J. W. Sloof 27 Feb. 1981 38 p refs Presented at IMA Conf. on Numer. Methods in Aeron. Fluid Dyn., Reading, 30 Mar. - 1 Apr. 1981
(NLR-MP-81007-U) Avail: NTIS HC A03/MF A01

Factors shaping the development of aeronautical fluid dynamics panel methods are classified as push factors (requirements originating from the user aerodynamicist) and pull factors which arise from advances in mathematical modelling and algorithm development). Improvements needed include: a higher level of automation in input preparation and presentation of results; better integration with other disciplines, higher accuracy and resolution because of anticipated inclusion of boundary layer effects for thin wing and internal flow applications; better representation of compressibility effects, in particular for low speed, high lift, and improved computational efficiency. Compared with 1970's techniques, the 1980's methods are expected to show an order of magnitude increase in algorithm efficiency and more exact representation of compressibility effects, including shock waves, by means of field source distributions.
Author (ESA)

N82-22929# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.

AN ALGORITHM FOR SINGLE MACHINE SEQUENCING WITH RELEASE DATES TO MINIMIZE TOTAL WEIGHTED COMPLETION TIME

A. M. A. Hariri and C. N. Potts (Keele Univ., England) Jun. 1981 17 p refs Submitted for publication

(MC-BW-143/81) Avail: NTIS HC A02/MF A01

A branch and bound algorithm for a problem in operations research is derived. Each of n jobs is to be processed without interruption on a single machine which can handle only one job at a time. Each job becomes available for processing at its release date, requires a processing time, and has a positive weight. Given a processing order of the jobs, the earliest completion time for each job can be computed. The objective is to find a processing order of the jobs which minimizes the sum of weighted completion times. A heuristic is presented which is used in calculating the lower bound. The lower bound is obtained by performing a Lagrangean relaxation of the release date constraints; the Lagrange multipliers are chosen so that the sequence generated by the heuristic is an optimum solution of the relaxed problem, thus yielding a lower bound. A method to increase the lower bound by deriving improved constraints to replace the original release date constraints is given. The algorithm, which includes several dominance rules, is tested on problems with up to fifty jobs. The computational results indicate that the version of the lower bound, using improved constraints, is superior to the original version. Author (ESA)

N82-22930# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.

THE B-REPRESENTATION OF PIECEWISE POLYNOMIAL PARAMETRIC CURVES AND LOCAL ADAPTATION

Albert B. Tol Aug. 1981 64 p refs

(MC-IW-177/81) Avail: NTIS HC A04/MF A01

Smooth curves (parametric curves: P = P(t) = (p sub 1 (t), ..., p dim (t)); each p sub i (t) is a piecewise polynomial function), based on a theory of b splines are described. Basic algorithms for the calculation of piecewise polynomial functions (pp functions), using b splines, are given. The theory is described in close connection with computer programs for plotting pp functions and curves. Local adaption to a data point, cyclic curves, and anticyclic continuations are main features. A complete computer program for plotting parametric curves is listed. An algorithm for dynamically adapting stepsize to curvature is also shown. Author (ESA)

N82-22931# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Applied Mathematics.

QUADRUPLE INTEGRAL EQUATIONS FOR THE CHARGED DISK AND COPLANAR ANNULUS

N. M. Temme and R. deBruin Jul. 1981 23 p refs Submitted for publication

(MC-TW-216/81) Avail: NTIS HC A02/MF A01

The axisymmetric potential problem for a plane circular electrode of radius a and a concentric annulus b < r < c (a<b) is formulated in terms of quadruple integral equations for the Hankel transform of the potential, then reduced to a single Fredholm equation. For small or large values of some combinations of the geometrical parameters a, b and c this equation was solved asymptotically. Author (ESA)

N82-22932# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Applied Mathematics.

OPTIMAL LOWER BOUNDS FOR THE SPECTRUM OF A SECOND ORDER LINEAR DIFFERENTIAL EQUATION WITH A P-INTEGRABLE COEFFICIENT

E. J. M. Veling Sep. 1981 12 p refs Submitted for publication

(MC-TW-218/81) Avail: NTIS HC A02/MF A01

The lower bounds for the spectrum of an operator T sub alpha, acting in the Hilbert space L2 (the set of positive real numbers) with complex elements, were improved upon. The differential expression M open brackets y close brackets is congruent to -y'' +qy, q belongs to L sup P (the set of positive real numbers) for some p > or = 1, is considered on open brackets zero, infinity) together with the boundary conditions either y = (zero) or y'(zero) = zero. Lower bounds for the spectrum of the self-adjoint operators T generated by M open brackets full point close brackets and these boundary conditions are given. Results show that the bounds depend on the L sup P norm of the coefficient q; for p > 1 the bounds are optimal. Results are formulated and proven for the operators T sub zero, i.e., Dirichlet boundary condition, and T sub (pi/2), i.e., Neumann boundary condition. Author (ESA)

N82-22933# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Applied Mathematics.

INVARIANT METHODS FOR VOLTERRA INTEGRAL EQUATIONS OF CONVOLUTION TYPE

O. Diekmann and S. A. vanGils Oct. 1981 57 p refs Submitted for publication

(MC-TW-219/81) Avail: NTIS HC A04/MF A01

The behavior of solutions of nonlinear Volterra convolution-integral equations near a constant solution is studied. A qualitative theory is built up in which a local semiflow that acts on a space of compactly supported forcing functions is associated with the Volterra equation. The general lines of the qualitative theory of ordinary differential equations are followed with emphasis on the interpretation of 'state' and 'forcing'. The linear case is discussed and a variation of constants formula is derived. Construction of the stable and the unstable manifold, corresponding to an equilibrium with no eigenvalues of the linearized equation on the imaginary axis (saddle point, property), is shown. As an application, the existence and uniqueness of positive solutions, defined for all time, of equations in population dynamics and epidemiology are considered. The situation where eigenvalues lie on the imaginary axis is then treated. A center manifold for a parametric equation is constructed and a Hopf bifurcation theorem is proved. Author (ESA)

N82-22934# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.

COLLOCATION METHODS FOR WEAKLY SINGULAR SECOND KIND VOLTERRA INTEGRAL EQUATIONS WITH NONSMOOTH SOLUTION

Hermann J. J. teRiele Nov. 1981 22 p refs Submitted for publication

(MC-NW-115/81) Avail: NTIS HC A02/MF A01

The solution is approximated near zero by a linear combination of powers of the square root of t, and away from zero by the usual polynominal representation. Convergence is proved and many numerical experiments are presented with examples from the literature. A method of Brunner et al, originally developed for this kind of equation with a smooth solution, is compared for the numerical approximation of the moment integrals which emerge in the collocation scheme. Author (ESA)

N82-22935# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.

DEFECT CORRECTION ITERATION AND SPLITTING METHODS FOR TIME-DEPENDENT PARTIAL DIFFERENTIAL EQUATIONS

P. J. vanderHouwen Nov. 1981 27 p refs Submitted for publication

(MC-NW-116/81) Avail: NTIS HC A03/MF A01

Nonlinear defect correction iteration is applied for solving the implicit relations which arise when an implicit linear multistep method is used in order to integrate semidiscrete initial value problems for partial differential equations. The approximate inverse, occurring in the defect correction process, is obtained by employigg splitting methods. In order to accelerate convergence, second degree Chebyshev iteration is used which is tuned in such a way that the lower frequencies in the iteration error are strongly damped without using a large number of iterations. Author (ESA)

N82-22936# Leiden Univ. (Netherlands). Dept. of Computer Science.

ALGEBRAIC SPECIFICATIONS FOR PARAMETERIZED DATA TYPES WITH MINIMAL PARAMETER AND TARGET ALGEBRAS

J. A. Bergstra and J. W. Klop (Stichting Mathematisch Centrum) Nov. 1981 25 p refs Submitted for publication

(MC-IW-183/81) Avail: NTIS HC A02/MF A01

A parameterized data type is conceived as a partial functor

phi: ALG (Sigma) tends to the limit ALG (Delta), where Delta is a signature, extending Sigma, and ALG (Sigma) is the class of minimal Sigma algebras which serve as parameters. One particular method of algebraically specifying parameterized data types is focused on: finite specifications with conditional equations, using auxiliary sorts and functions provided with initial algebra semantics. The concept of an effective parameterized data type is introduced. A satisfactory adequacy result is then obtained. Each effective parameterized data type possesses a finite algebraic specification under initial semantics. Author (ESA)

N82-23123*# Arizona State Univ., Tempe. Dept. of Physics.
LANGMUIR PROBE THEORY AND THE PROBLEM OF ANISOTROPIC COLLECTION Final Report
A. Kyrala *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 38 p refs (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 12A

N82-22148# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
ALGORITHMS FOR THE COMPUTATION OF EVEN AND ODD FOURIER-BESSEL TRANSFORMS
S. Candel *In its* La Rech. Aerospatiale, Bi-monthly Bull. No 1981-5, Sep. - Oct. 1981 (ESA-TT-725) Feb. 1982 p 23-34 refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel (Paris), No. 1981-5, Sep. - Oct. 1981 (For primary document see N82-22145 13-01)
Avail: NTIS HC A04/MF A01; original report in FRENCH available at ONERA, Paris FF 45

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

No abstracts in this category.

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N82-22937# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
VERANA: A COMPUTER PROGRAM FOR CALCULATING WEAPON EFFICIENCY IN COMPLEX SYSTEMS [VERANA -ETT DATORPROGRAM FOER BERAEKNING AV VAPENVERKAN I KOMPLEXA SYSTEM]
Ingemar Andersson May 1981 91 p ref In SWEDISH
(FOA-C-20412-D8) Avail: NTIS HC A05/MF A01

A program for two step calculation of weapon efficiency is presented. First the probabilities of destroying the vulnerable components of a target are calculated. Based on these probabilities and on knowledge of the components of the target and their functions, the probability of destroying these functions is computed. Determination of these probabilities using the VERANA program (a part of the VERSAM program) is described. This program has been used to calculate the efficiency of weapons used against ships, but can be used in regard to other types of targets. The program can be applied to comparison of the efficiency of various weapons and to judgement of target protection and maintenance. The HTEST and HPROD programs for testing and storage of functional descriptions are also considered. J.D.

N82-22938# Research Inst. of National Defence, Stockholm (Sweden). Huvudavedelning 2.
MODEL FOR CALCULATING THE PROBABILITIES OF DETECTION, TARGET RECOGNITION AND ACCURACY OF TERMINAL GUIDED AMMUNITION [MODELL FOER BERAEKNING AV SANNOLIKHETER FOER UPPTAECKT, MAALLAASNING OCH TRAEFF FOER SLUTFASSTYRD AMMUNITION]
Boerje Aulin Jun. 1981 46 p In SWEDISH
(FOA-C-20416-D8) Avail: NTIS HC A03/MF A01

A Monte Carlo model that calculates the probabilities of detection, target recognition, and accuracy of terminal guided ammunition aimed at land and sea targets is described. The most important data are target group, target area, cloudiness, size of the ammunition round, aim, uncontrollable trajectory, target position error, ballistic spread, the detector opening angle and range, target recognition capabilities, guiding capacity and guiding precision. The model was programmed for alpha numerical graphic dialog run with the DEC-10. The possibility that one or more targets are found in the field of vision and/or in the guidance range, and the number of single and multiple hits per round of ammunition are among the output data. J.D.

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N82-22939# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
A NOTE ON NONGENERATORS OF FULL ABSTRACT FAMILY OF LANGUAGES (AFLS)
Peter R. J. Asveld and Joost Engelfriet (Twente Univ. of Technology, Enschede, Netherlands) Dec. 1981 8 p refs Submitted for publication
(MC-IW-184/81) Avail: NTIS HC A02/MF A01

Two definitions of nongenerator for full AFLs are compared, leading to two sets of nongenerators for each full AFL K. The result shows a necessary and sufficient condition on K such that these sets coincide. Author (ESA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N82-22940# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
SIMPLE INEQUALITIES IN THE VIBRATING STRING AND HEAT CONDUCTION PROBLEMS
M. Pachter and R. I. Becker (Cape Town Univ.) Jul. 1981 26 p refs
(CSIR-T-WISK-211) Avail: NTIS HC A03/MF A01

Certain inequalities are presented, related to the L(2) norms of the solutions to the vibrating string and heat conduction partial differential particular, an 'L(2) maximum principle' is derived for the heat equation, and similar inequalities for the vibrating string problem. M.G.

N82-22941# Centre National d'Etudes Spatiales, Toulouse (France).
TIME AND DATING AT CNES [LE TEMPS ET LA DATATION AU CNES]
Mar. 1981 210 p refs In FRENCH Proc. held at Toulouse, 10-12 Mar. 1981 Report will also be announced as translation (ESA-TT-751)
(ESA-TT-751) Avail: NTIS HC A10/MF A01

Different time scales (astronomical, atomic, universal,...) are presented and discussed. Their unification and utilization in space research was emphasized. Particular results relate to the general concept of time and its implications for theoretical physics. Practical results bear on clock synchronization and the dating of spaceborne remote sensing measurements. For individual titles, see N82-22942 through N82-22946.

N82-22942# Centre National d'Etudes Spatiales, Toulouse (France).
THE CONCEPT OF TIME IN PHYSICS [LE CONCEPT DE TEMPS EN PHYSIQUE]
Michel Avignon *In its* Time and Dating at CNES Mar. 1981 p 1-54 refs In FRENCH (For primary document see N82-22941 13-70)

Avail: NTIS HC A10/MF A01

The historical evolution of the concept of time in physics is surveyed. The shift from perceived (psychological) time to absolute time in classical mechanics as explained by Newton is considered. Newtonian absolute time is then compared to time in relativity theory. The notion of simultaneity, restricted relativity, and Minkowski space-time are reviewed. This leads to time in thermodynamics and quantum mechanics. Statistical theories are discussed, including entropy gain and time tensors. The theory of time as an operator which measures the evolution of weakly stable systems is also mentioned. Author (ESA)

N82-22943# Centre National d'Etudes Spatiales, Toulouse (France).

THE TIME SCALES OF ASTRONOMERS [LES TEMPS DES ASTRONOMES]

Jean-Louis Pieplu *In its* Time and Dating at CNES Mar. 1981 p 55-87 refs In FRENCH (For primary document see N82-22941 13-70)

Avail: NTIS HC A10/MF A01

The elaboration of astronomical time scales is discussed. Time in function of the rotation of the Earth is considered. Stellar time and sidereal time are compared. Time measurement by sidereal time is explained. Differences between mean solar time and sidereal time are pointed out. True solar time and a time equation are specified. Time in the function of planetary motions, irregularities in the rotation of the Earth, and universal time are also examined. Author (ESA)

N82-22944# Centre National d'Etudes Spatiales, Toulouse (France).

TIME AND ATOMIC CLOCKS [LE TEMPS ET LES HORLOGES ATOMIQUES]

Michel Brunet *In its* Time and Dating at CNES Mar. 1981 p 88-123 In FRENCH (For primary document see N82-22941 13-70)

Avail: NTIS HC A10/MF A01

Quartz clocks and atomic clocks are characterized and discussed. The general principle behind atomic standards is exposed, including the cesium jet, rubidium vapor, and hydrogen maser standards. Performances are compared for stability, exactitude, and reproducibility. Atomic time scales are then considered. The constitution of a clock is explained, relating to the International Atomic Time and Universal Time Coordinated scales. The role of the Bureau International de l'Heure is mentioned, especially as concerns French atomic time. Author (ESA)

N82-22945# Centre National d'Etudes Spatiales, Toulouse (France).

TEMPORAL DISTRIBUTION AND CLOCK SYNCHRONIZATION [DISTRIBUTION DU TEMPS ET SYNCHRONISATION DES HORLOGES]

Francois Nouel and Michel Brunet *In its* Time and Dating at CNES Mar. 1981 p 124-174 In FRENCH (For primary document see N82-22941 13-70)

Avail: NTIS HC A10/MF A01

Synchronization and relativity are discussed, emphasizing the role of time in space technology. Space-time is modeled mathematically and synchronization is defined. Synchronization by the physical displacement of a clock and by signal transmission are considered. A reference time common to all measurements is cited and measurement techniques are reviewed, especially satellite trajectory calculation. The Transit system and the Global Positioning System (NAVSTAR) are characterized as examples. Synchronization by Earth links and by space links are compared for performance. Author (ESA)

N82-22946# Centre National d'Etudes Spatiales, Toulouse (France).

DATING TELEMETRIC MEASUREMENTS [DATATION DES TELEMESURES]

Jean-Claude Vallat *In its* Time and Dating at CNES Mar. 1981 p 176-206 refs In FRENCH (For primary document see N82-22941 13-70)

Avail: NTIS HC A10/MF A01

General principles of telemetry are surveyed and different methods of dating are reviewed, emphasizing spaceborne remote sensing applications. Onboard data multiplexing, signal transmission and reception, signal recording, and data processing (analog, PCM, PSK signals) are characterized. Time codes are discussed, i.e., PADTC, TRIG B and NASA 36, and TRIG A. Time readers are considered, including utilization, operating modes, and measured performance. Dating errors due to data analysis are identified. The necessity of onboard dating is seen; the SPOT dating scheme is cited as an example. Author (ESA)

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N82-22947*# Texas A&M Univ., College Station. Dept. of Mechanical Engineering.

THE ROLE OF COHERENT STRUCTURES IN THE GENERATION OF NOISE FOR SUBSONIC JETS Yearly Progress Report, 1 Nov. 1980 - 31 Oct. 1981

Gerald L. Morrison 5 Apr. 1982 109 p refs

(Grant NAG1-112)

(NASA-CR-168764; NAS 1.26:168764) Avail: NTIS HC A06/MF A01 CSCL 20A

The coherent structure in high Reynolds number (184,000 to 262,000), Mach number 0.6 to 0.8 axisymmetric cold air jets exhausting at atmospheric pressure was studied. The mean flow and the statistical time averaged turbulence properties were measured. Spectra showed a very broad frequency content which shifted towards the lower frequencies as the flow progressed downstream. Axial wave number measurements indicate that the axial wave number-frequency relationship was the same for a wide range of Mach (0.3 to 2.5) and Reynolds (3,700 to over 200,000) numbers. Measurements of the azimuthal mode numbers show that several modes from $n = -3$ to $+3$ exist simultaneously in various quantities that the different frequencies studied. Acoustic measurements were made in the near field of the Mach number 0.6 jet. Sound pressure level contours showed that noise appeared to be radiated from a location near the end of the potential core. Directivity plots revealed that the spectra of this noise shifted towards higher frequencies as the angle from the jet axis increased. It was also found that mid-band excitation frequencies produced an increase in full spectrum noise. M.G.

N82-22948*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

SOUND FIELD DIFFUSIVITY IN NASA LANGLEY RESEARCH CENTER HARDWALLED ACOUSTIC FACILITIES

Michael C. McGary Mar. 1982 36 p refs

(NASA-TM-83275; NAS 1.15:83275) Avail: NTIS HC A03/MF A01 CSCL 20A

Cross correlation measurements were performed to determine the quality of the sound fields in the ANRL reverberation room and the ANRL transmission loss facility. The results indicate the level of sound field diffuseness which may be attained in these hardwalled acoustic facilities. Author

N82-22949*# Kentron International, Inc., Hampton, Va.

PROGRAM FOR NARROW-BAND ANALYSIS OF AIRCRAFT FLYOVER NOISE USING ENSEMBLE AVERAGING TECHNIQUES

Doreen Gridley Mar. 1982 70 p refs

(Contract NAS1-16000)

(NASA-CR-165867; NAS 1.26:165867) Avail: NTIS HC A04/MF A01 CSCL 20A

A package of computer programs was developed for analyzing acoustic data from an aircraft flyover. The package assumes the aircraft is flying at constant altitude and constant velocity in a fixed attitude over a linear array of ground microphones. Aircraft position is provided by radar and an option exists for including the effects of the aircraft's rigid-body attitude relative to the flight path. Time synchronization between radar and acoustic recording stations permits ensemble averaging techniques to be applied to the acoustic data thereby increasing the statistical accuracy of the acoustic results. Measured layered meteorological

data obtained during the flyovers are used to compute propagation effects through the atmosphere. Final results are narrow-band spectra and directivities corrected for the flight environment to an equivalent static condition at a specified radius. R.J.F.

N82-22950*# Texas A&M Univ., College Station. Dept. of Mechanical Engineering.

THE ROLE OF COHERENT STRUCTURES IN THE GENERATION OF NOISE FOR SUBSONIC JETS Semiannual Progress Report, 1 Nov. 1981 - 21 Apr. 1982

Gerald L. Morrison and K. W. Whitaker 21 Apr. 1982 36 p refs Proposed for presentation at the ASME Winter Annual Meeting, 1982

(Grant NAG1-112)

(NASA-CR-168793; NAS 1.26:168793) Avail: NTIS HC A03/MF A01 CSCL 20A

Acoustic measurements were made in the 'near' ($r/D < 60$, $x/D < 60$) field for high Reynolds number (184,000 to 262,000) axisymmetric cold air jets exhausting at atmospheric pressure. These measurements were in conjunction with an investigation which characterized the large scale coherent structure in the flow field of Mach number 0.6 to 0.8 jets. Natural jets as well as artificially excited jets were studied. Directivity plots were made for both natural jets and jets excited at various frequencies. Overall noise radiated by the jets reached a maximum value around 30 deg from the jet axis. However, individual frequencies emitted maximum sound pressure level at different angles from the jet axis. As the angle from the jet axis increased, the spectra of the noise shifted to higher frequencies. S.L.

N82-22951*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PRESSURE TRANSFER FUNCTION OF A JT15D NOZZLE DUE TO ACOUSTIC AND CONVECTED ENTROPY FLUCTUATIONS

J. H. Miles 1982 39 p refs Presented at the 103rd Meeting of the Acoust. Soc. of Am., Chicago, 26-30 Apr. 1982

(NASA-TM-82842; E-1212; NAS 1.15:82842) Avail: NTIS HC A03/MF A01 CSCL 20A

An acoustic transmission matrix analysis of sound propagation in a variable area duct with and without flow is extended to include convected entropy fluctuations. The boundary conditions used in the analysis are a transfer function relating entropy and pressure at the nozzle inlet and the nozzle exit impedance. The nozzle pressure transfer function calculated is compared with JT15D turbofan engine nozzle data. The one dimensional theory for sound propagation in a variable area nozzle with flow but without convected entropy is good at the low engine speeds where the nozzle exit Mach number is low ($M = 0.2$) and the duct exit impedance model is good. The effect of convected entropy appears to be so negligible that it is obscured by the inaccuracy of the nozzle exit impedance model, the lack of information on the magnitude of the convected entropy and its phase relationship with the pressure, and the scatter in the data. An improved duct exit impedance model is required at the higher engine speeds where the nozzle exit Mach number is high ($M = 0.56$) and at low frequencies (below 120 Hz). B.W.

N82-22952*# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.

ANALYTICAL PREDICTION OF THE INTERIOR NOISE FOR CYLINDRICAL MODELS OF AIRCRAFT FUSELAGES FOR PRESCRIBED EXTERIOR NOISE FIELDS. PHASE 2: MODELS FOR SIDEWALL TRIM, STIFFENED STRUCTURES AND CABIN ACOUSTICS WITH FLOOR PARTITION

L. D. Pope and E. G. Wilby Apr. 1982 212 p refs

(Contract NAS1-15782)

(NASA-CR-165869; NAS 1.26:165869) Avail: NTIS HC A10/MF A01 CSCL 20A

An airplane interior noise prediction model is developed to determine the important parameters associated with sound transmission into the interiors of airplanes, and to identify apropriate noise control methods. Models for stiffened structures, and cabin acoustics with floor partition are developed. Validation studies are undertaken using three test articles: a ring stringer stiffened cylinder, an unstiffened cylinder with floor partition, and ring stringer stiffened cylinder with floor partition and sidewall trim. The noise reductions of the three test articles are computed using the heoretical models and compared to measured values. A statistical analysis of the comparison data indicates that there is no bias in the predictions although a substantial random error exists so that a discrepancy of more than five or six dB can be expected for about one out of three predictions. S.L.

N82-22953# National Aerospace Lab., Tokyo (Japan). Noise and Emission Research Group.

AERODYNAMIC NOISE GENERATED BY JET-WING/FLAP INTERACTIONS OF THE EXTERNAL USB CONFIGURATION OF STOL AIRCRAFT. PART 1: EIGHT PERCENT SCALE COLD-FLOW MODEL ANALYSIS

Masataka Maita, , and Shigemi Shindo Oct. 1981 29 p refs (NAL-TR-685T; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

The acoustic characteristics of the external upper surface blowing (USB) concept of a powered high lift system (PHLS) were studied experimentally using an 8%-scale static cold flow model. Observations of exhaust jet flow attachment and spreading characteristics on wing/flap surface were also carried out using several flow visualization techniques. Noise reduction data were obtained by optimizing basic jet nozzle wing/flap structural geometries for the lowest noise. Among the associated parameters which define USB-PHLS configurations, (1) the location relative to wing/flap and the shape of the exhaust jet nozzle and (2) flow attachment devices are important parameters. Flow characteristics dependence on these parameters and PHLS noise were also obtained. From far field noise spectra overall sound pressure level dependence on jet velocity and coherence across near field surface pressure, it was concluded tht the flap trailing edge noise was the most predominant noise source. Several acoustically treated flaps and serrated trailing edge design techniques were applied to attenuate edge noise. Author

N82-22954# National Aerospace Lab., Tokyo (Japan).

FATIGUE DAMAGE ESTIMATION USING IRREGULARITY FACTOR. FIRST REPORT, IRREGULARITY FACTOR CALCULATIONS FOR NARROW AND BROADBAND RANDOM TIME HISTORIES

Ippei Susuki Nov. 1981 15 p refs In JAPANESE; ENGLISH summary

(NAL-TR-688; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The results of an analysis of the irregularity factors of stationary and Gaussian random processes which are generated by filtering the output of a pure or a band-limited white noise are presented. An ideal band pass filter, a trapezoidal filter, and a Butterworth type band pass filter were examined. It was found that the values of the irregularity factors were approximately equal among these filters if only the end-slopes were the same rates. As the band width of filters increases, irregularity factors increase monotonically and approach the respective constant values depending on the end-slopes. This implies that the noise characteristics relevant to the fatigue damage such as statistical aspects of the height of the rise and fall or the distribution of the peak values are not changed for a broad band random time history. It was also found that the effect of band limitation of input white noise on irregularity factors is negligibly small. M.G.

N82-22955*# DyTec Engineering, Inc., Long Beach, Calif.

RECOMMENDATIONS FOR FIELD MEASUREMENTS OF AIRCRAFT NOISE Final Report

Alan H. Marsh Washington NASA Apr. 1982 94 p refs

(NASA-CR-3540; NAS 1.26:3540) Avail: NTIS HC A05/MF A01 CSCL 20A

Specific recommendations for environmental test criteria, data acquisition procedures, and instrument performance requirements for measurement of noise levels produced by aircraft in flight are provided. Recommendations are also given for measurement of associated airplane and engine parameters and atmospheric conditions. Recommendations are based on capabilities which were available commercially in 1981; they are applicable to field tests of aircraft flying subsonically past microphones located near the surface of the ground either directly under or to the side of a flight path. Aircraft types covered by the recommendations include fixed-wing airplanes powered by turbojet or turbofan engines or by propellers. The recommended field-

measurement procedures are consistent with assumed requirements for data processing and analysis. R.J.F.

N82-22956# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).
TEMPORAL AND SPATIAL DISPERSION OF SOUND LEVELS IN A REVERBERANT SPACE
J. P. Guilhot (Toulouse Univ., France), C. Legros (Toulouse Univ., France), and J. P. Flenner (Toulouse Univ., France) 1982 21 p refs Transl. into ENGLISH from Acustica (France), v. 48, no. 4, 1981 p 232-238
(NRC/CNR-TT-2015; ISSN-0077-5606) Avail: NTIS HC A02/MF A01

The spatial and temporal variances of the level of the acoustical pressure measured in a reverberant space were determined. Acoustical measurements in rooms are generally made with the aid of a random excitation signal, white noise or pink noise and the sound level measured at a point, fluctuates depending on the duration of the integration and of the bandwidth of the noise. The measurement point is chosen in a random fashion in the room and the sound field is simulated by a multidimensional random process which depends on time and on space. The mean square value of the acoustic pressure in time and in space is estimated. Spatial mean is estimated by sampling, by the choice of positions of source and of the point of measurement and the mean over time by an integration of a finite duration. E.A.K.

N82-22957# Ecole Centrale de Lyon (France). Lab. de Mecanique des Fluides et d'Acoustique.
EUROMECH 142: ACOUSTICS OF TURBULENT FLOWS
1981 159 p refs Partly in ENGLISH and FRENCH Presented at Lyon, 23-25 Sep. 1981; Sponsored by CNRS, Direction des Recherches Etudes et Techniques, and Delegation Gen. a la Recherche Sci. et Technique
Avail: NTIS HC A08/MF A01

Sound sources in shear layers and free jets, airfoil and flexible surfaces noise, acoustic wave propagation in ducts, noise, reduction and combustion noise were discussed. Calculation and experimental methods are described. Noise caused by multiple jets, cold jets, two dimensional jets, overexpanded jets, subsonic jets and supersonic jets is investigated. For individual titles, see N82-22958 through N82-22988.

N82-22958# Cambridge Univ. (England). Emmanuel College.
SOUND GENERATION BY SOURCES NEAR THE INTERFACE OF DIFFERENT MEDIA
J. E. Ffowcs Williams *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 4 p (For primary document see N82-22957 13-71)
Avail: NTIS HC A08/MF A01

Ambiguities which arise when describing acoustic sources, originating from inhomogeneities of density near the source region, are discussed. The importance of terms neglected in usual forms of Lighthill's acoustic analogy is shown. The source accompanying the fictitious creation of mass at a rate q per unit volume is considered. The linearized nonconservation equation and the linearized momentum in an inviscid flow equation combine to give an inhomogeneous wave equation in which q appears as the source of sound rather than the volume displaced by the created mass. The error arises from neglect of the source term 1/c squared (delta squared/delta t squared) (p - c squared rho) in Lighthill's equation. Author (ESA)

N82-22959# Institut Franco-Allemand de Recherches, St. Louis (France).
CONTRIBUTION TO THE STUDY OF COHERENT STRUCTURES IN AN EXCITED CIRCULAR JET [CONTRIBUTION A L'ETUDE DES STRUCTURES COHERENTES D'UN JET ROND EXCITE]
J. Haertig, R. Meyer, and F. Schlosser *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 4 p refs In FRENCH (For primary document see N82-22957 13-71)
Avail: NTIS HC A08/MF A01

An analytical method for calculating the evolution of the coherent structures associated with the excitation of an axisymmetric free jet is presented. The amplitudes of the instability waves are calculated from the integral equations of the energy balance. Plotting these amplitudes shows the saturation of the coherent structures, coinciding with the increase in broadband noise observed for strong excitation. Calculated values were compared with laser anemometer measurements. Longitudinal velocity profiles, velocity cross sections and field emission lines agree well for calculated and measured values. Author (ESA)

N82-22960# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
NOISE RADIATION OF MULTIPLE JETS
J. Kompenhans and F. R. Grosche *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 4 p refs (For primary document see N82-22957 13-71)
Avail: NTIS HC A08/MF A01

The influence on noise radiation of the sharp edges on both sides of the orifices of a perforated plate was examined. Plates with orifices of different diameters and with sharp or slightly rounded edges were tested. The plates and a nozzle were attached to a settling chamber, a muffler and a compressed air supply in an anechoic room. The angular distribution of the radiated noise was measured by a microphone moving on a circular path ground the sound source at 2 m distance. The sound power levels for the plates nearly coincide when plotted as a function of jet exit velocity. The noise radiated by the plates grows according to Lighthill's law. Edge shape of the orifices has a minor influence on noise radiation. Tone radiation can appear in the velocity range from 100 to 250 m/sec for thick plates. Author (ESA)

N82-22961# Institut Franco-Allemand de Recherches, St. Louis (France).
STUDY OF EQUIVALENT NOISE SOURCES IN COLD JETS USING THE CASUALITY METHOD [ETUDE DES SOURCES DE BRUIT EQUIVALENTES DANS LES JETS FROIDS AU MOYEN DE LA METHODE DE CAUSALITE]
Martin Schaffar *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 4 p refs In FRENCH (For primary document see N82-22957 13-71)
Avail: NTIS HC A08/MF A01

Noninvasive techniques for studying jet noise are presented. A velocity-acoustic pressure correlation method, a velocity-mirror measured acoustic pressure correlation technique, and an acoustic pressure-mass volume D'Alembertian operator correlation are discussed. The first method was used to measure correlations between axial in-jet velocity fluctuations and far field noise. The second was applied to local noise source density. The third was used to investigate an ambient temperature jet at 100 points. Results are similar for all methods, showing that an acoustically active low frequency zone is the transition region for angles close to the axis. The mixing zone radiates more noise at high frequencies. Shear noise dominates self noise up to 45 deg. Equivalent sources are more concentrated in the area of the jet directly aligned with the microphone. Author (ESA)

N82-22962# New South Wales Univ., Sydney (Australia). School of Mechanical Engineering.
ACOUSTIC EMISSION FROM FREE JETS
S.-L. Hall *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 4 p (For primary document see N82-22957 13-71)
Avail: NTIS HC A08/MF A01

Nozzle centered radiation, wider spaced waves, and low angle waves are seen in correctly expanded supersonic jets. In working conditions, shock jet interaction, resulting from incorrect expansion, generates additional high frequency noise. Underexpanded jets emit more noise than overexpanded jets, due to operating at higher Mach numbers and oscillations of the shock cells. Shadowgraphs and Schlieren photographs show that helium jets have larger angles and greater extent of noise radiation than air jets. Mathematical models for correctly expanded supersonic air jets exhausting into the quiescent atmosphere, given no extraneous shocks near the nozzle exit, calculate acoustic wave angles to within 3 deg of measured values. Similar accuracy is achieved for helium jets when the ratio of acoustic impedances is used to correct the air jet values for refraction and convection effects. Models give reasonably good prediction of wave angles from + or - 50% of the correct expansion. For jets without extraneous

shocks, when correctly expanded, calculated angles are within 4 deg of measured values. Author (ESA)

N82-22963# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Berlin (West Germany). Abt. Turbulenzforschung.

PREDICTION OF FLYOVER JET NOISE SPECTRA FROM STATIC TESTS

Ulf Michel and Alfons Michalke (Technische Univ., Berlin) *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 4 p refs (For primary document see N82-22957 13-71)

Avail: NTIS HC A08/MF A01

A scaling law for predicting the overall flyover noise of a single stream shock-free circular jet from static experiments is outlined. It is valid for isothermal and hot jets. It assumes that the jet flow and turbulence field are axially stretched in flight. Effects of the boundary layer within the nozzle and along the engine nacelle are neglected. The scaling laws for the power spectral density and spectra with constant relative bandwidth can be derived. In order to compare static and inflight directivities, the far field point relative to the source position must be denoted by the emission angle and the wave normal distance. From the solution of the convective Lighthill equation in a coordinate system fixed to the jet nozzle (wind tunnel case), the power spectral density of sound pressure at a given frequency is found. Predictions for Aerotrain compare well with measured values. Author (ESA)

N82-22964# Cambridge Univ. (England). Dept. of Engineering.

SOUND PRODUCTION IN A TURBULENT BOUNDARY LAYER OVER A FLEXIBLE SURFACE

A. P. Dowling *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 4 p refs (For primary document see N82-22957 13-71)

Avail: NTIS HC A08/MF A01

The Lighthill theory was extended and used to determine the flow noise induced by a turbulent boundary layer over a plane flexible surface. The surface is assumed to be homogeneous and of infinite extent with a mean position x sub 3 = 0. Its properties are specified by a compliance condition, relating the Fourier transforms of displacement and pressure perturbation at the surface. For hard surfaces, the inclusion of the mean flow profile controls surface pressure singularity for upstream propagating spectral elements, but enhances singularity for those propagating downstream. Bending plates with the front surface exposed to the turbulent boundary layer and backed by a void are sufficiently massive compared with the effective fluid loading to behave like a hard surface. Underwater the Mach number is so low that surface properties dominate the pressure spectrum. The noise reducing effect of a surface layer of compliant material increases as its thickness or sound speed increases or as fluid density decreases. Author (ESA)

N82-22965# Southampton Univ. (England). Inst. of Sound and Vibration Research.

SOUND RADIATION FROM FLEXIBLE BLADES

S. Glegg *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 4 p refs Sponsored by UK Ministry of Defence (For primary document see N82-22957 13-71)

Avail: NTIS HC A08/MF A01

Engine blade aerodynamic loads due to inflow distortions, vibration, and the apparent mass loading of a vibrating airfoil are analyzed. Comparison between strip theory and a three dimensional lifting surface theory shows that strip theory overestimates the response by < 1.5 db over the whole frequency range. Strip theory reliably estimates aerodynamic loads resulting from oscillations of the blade normal to the direction of motion. If the attached mass loading is greater than the fluctuating lift, it makes a significant contribution to the radiated noise. Noise from a six cylinder diesel engine whose fan has a high hub/tip ratio was measured. Axial vibration of the fan assembly was expected to radiate sound from the hub and the blades, so one test set up included a rubber vibration isolator ring on the shaft. Laser measurements demonstrate that at higher engine speeds the sixth harmonic of the shaft rotation frequency dominates axial vibration. The rubber isolator assembly is 16 db quieter than the other at this harmonic, but no change is noticed at the blade passing frequency. Author (ESA)

N82-22966# United Technologies Research Center, East Hartford, Conn.

LEADING AND TRAILING EDGE NOISE OF AN AIRFOIL

R. K. Amiet *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 4 p (For primary document see N82-22957 13-71)

Avail: NTIS HC A08/MF A01

Theoretical and experimental predictions of the noise produced when a rigid surface, e.g., an airfoil, with a sharp edge is introduced into a turbulent flow are compared. For an airfoil in rectilinear motion agreement is good. It is better for leading edge than for trailing edge noise because of lack of knowledge of boundary layer surface pressure. For a rotating airfoil, leading edge noise produces spectral peaking around harmonics of blade passage frequency because of multiple eddy chopping. Trailing edge noise produces a broad spectrum. For skewed inflow to a rotor, e.g., a helicopter in forward flight, narrow band tones rapidly degenerate because of the turbulent eddies in the rotor plane. Theory and measurement agree well for helicopters, but not as closely as for airfoils. Author (ESA)

N82-22967# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

DISCRETE FREQUENCY NOISE GENERATION BY QUASI TWO DIMENSIONAL AIR JET IMPINGING ON VARIOUS OBSTACLES

W. M. Jungowski and G. E. A. Meier *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 4 p (For primary document see N82-22957 13-71)

Avail: NTIS HC A08/MF A01

Self-induced flow oscillation generated by the impingement of a gas jet on walls, tubes, wedges or cavities was studied. Ambient air was sucked through a rectangular converging nozzle into the plenum chamber of a vacuum wind tunnel containing obstacles. The flow field was studied, using high speed photography, interferometers, and spectral analysis. Results show that the side walls of the tunnel neither prevent self-induced oscillations of the flow nor change it in an obvious way. The amplitudes of pressure fluctuations increase with the efficiency of the resonator and kinetic energy of the jet unless it becomes very stable. The frequency of the oscillation depends mainly on the resonator, even if the oscillation is caused by the shear layer instability in a subsonic flow or shock wave instability in a supersonic jet. Author (ESA)

N82-22968# Institut de Mecanique des Fluides de Marseille (France).

ON THE INSTABILITY AND ACOUSTIC EMISSION OF SUPERSONIC OVEREXPANDED JETS

E. Brocher and J. P. Gondran *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 4 p (For primary document see N82-22957 13-71)

Avail: NTIS HC A08/MF A01

Low frequency noise produced by supersonic overexpanded jets at certain counterpressure ranges was studied by hydraulic analogy. The oscillation frequency of the jet is quite small, leading to a wavelength about 10 times the nozzle exit width. The origin of the emitted waves is at the downstream end of the second shock cell. Velocity profile measurements show that large vortices are shed at low frequency over all the counterpressure range. These vortices induce a lateral motion of the jet which can become large if the jet is unstable. Theoretical prediction that the shock structure near the nozzle exit is unstable for a certain counterpressure range corresponds to experimental observation. A plot of the amplitude of the wave produced as a function of the Strouhal number is a good indication of pressure-instability coupling. Author (ESA)

N82-22969# Ecole Centrale de Lyon (France). Lab. de Mecanique des Fluides et d'Acoustique.

NEAR FIELD ACOUSTIC ENERGY FLUX MEASUREMENT IN A SUBSONIC JET [MESURE DU FLUX D'ENERGIE ACOUSTIQUE DANS LE CHAMP PROCHE D'UN JET SUBSONIQUE]

D. Juve *In its* Euromech 142: Acoustics of Turbulent Flows

1981 5 p refs In FRENCH (For primary document see N82-22957 13-71)
(Contract DRET-80/059)
Avail: NTIS HC A08/MF A01

The average near field acoustic intensity vector of a rotating subsonic jet was obtained from the cross spectra of microphone signals. Cross spectra were calculated, using a 0 to 10 kHz, 25 Hz band analyzer. Vector intensity was computer produced. A density chart was traced on a digital table. Premeasurement checkout of the sampling method was satisfactory (+ or - 2 deg precision for angles within + or - 45 deg of the sound axis). Results indicate localization of the most effective sources around 3 to 4 dia. This agrees with polar correlation technique far field values. At low frequencies the acoustic field is contaminated by aerodynamic noise pressure. Author (ESA)

N82-22970# Technische Univ., Berlin (West Germany).
SOME REMARKS ON SOURCE COHERENCE AFFECTING JET NOISE
Alfons Michalke *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 4 p refs (For primary document see N82-22957 13-71)
Avail: NTIS HC A08/MF A01

Literature on integral coherence length scales derived from cross spectral densities of jet noise is reviewed. Suggestions that coherent structures do not radiate sound significantly are criticized, since sound power measured experimentally consists of contributions from the excited sound field and from flow radiated sound. Theory shows that by increasing axial source coherence the radiated sound power can be strongly reduced at subsonic jet Mach numbers. The influence of azimuthal source coherence on the sound field radiated by a monopole source was investigated theoretically. Power spectral density and axisymmetric content increase significantly with increasing source coherence. If the dominating source term of shear noise for theta = 70 deg, which is proportional to the radial mean velocity, is introduced into the model, the least coherent source radiates most intensely. A strong second azimuthal sound component is present in the far field unless the source is very strongly coherent. Author (ESA)

N82-22971# Stanford Univ., Calif. Dept. of Mathematics.
A FAR FIELD ESTIMATE FOR SOURCE INTEGRALS
Harold Levine *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 5 p (For primary document see N82-22957 13-71)
Avail: NTIS HC A08/MF A01

A mathematical stratagem, based on a relation of asymptotic equivalence, is proposed for ascertaining far field source behavior. The relation associates a plane wave function at locations remote from a central reference point with a combination of converging and diverging spherical wave functions along the direction of its normal or propagating vector. An integral extended over all directions in space of a unit vector leads to an asymptotic characterization of a Fourier transform of the integrand function. Author (ESA)

N82-22972# Technische Hochschule, Aachen (West Germany). Inst. fuer Technische Thermodynamik.
COMPUTATION OF DENSITY FLUCTUATIONS IN DIFFUSION FLAMES WITH IMPLICATIONS FOR COMBUSTION NOISE
J. Janicka and John L. Lumley (Cornell Univ., Ithaca, New York) *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 4 p refs Sponsored by US Office of Naval Research (For primary document see N82-22957 13-71)
Avail: NTIS HC A08/MF A01

A second order model for nonconstant density, nonreacting flow is extended to diffusion flames with fast chemistry. Since only first order terms were taken into account, the effects of mixing and heat release are superposable, and the changes required are limited to a change in the value of the expansion parameter. The model was applied to H2 flame calculations. Radial profiles of the contributions to the expansion parameter and of the mean density indicate that the contribution to the expansion parameter from mixing is unimportant compared to that from reaction. The expansion parameter is not large throughout the zone in which significant reaction and mixing takes place. The first neglected term is at worst on the order of 16%, which is probably on the order of accuracy of the measurements. For combustion noise applications (expansion parameter value x mean velocity)/Taylor density microscale is calculated. Author (ESA)

N82-22973# New South Wales Univ., Sydney (Australia). School of Mechanical Engineering.
CHARACTERISTICS OF GASEOUS FLAMES USING OXYGEN INSTEAD OF AIR
S.-L. Hall *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 3p refs (For primary document see N82-22957 13-71)
Avail: NTIS HC A08/MF A01

The acoustic features of gaseous hydrocarbon fuels which use oxygen as oxidizer were studied. A welding torch was used to generate single flames over the range of 15 to 60 m/sec (premixed cold flow velocity). The slowest flame was laminar, while all others were turbulent. The appearance of each flame varied from diffusion to premixed. The maximum sound directivity angle for six test cases occurs between 72 and 80 deg from the flame axis. Frequency spectra were obtained in one octave, one third octave, and six percent bandwidths. Peak frequencies are in the 1 to 9 kHz range. Schlieren photographs show the flame structure to be more analogous to high speed (cold) jets than to hydrocarbon/air flames. Maximum sound pressure levels increase with increasing mixture flow velocity. Peak frequency in the broadband spectra is essentially independent of flow velocity. Author (ESA)

N82-22974# Societe Bertin et Cie, Plaisir (France).
BEHAVIOR OF A HELMHOLTZ RESONATOR WITH FLEXIBLE SIDES IN THE PRESENCE OF HYDRODYNAMIC TUNNEL FLOW [COMPORTEMENT D'UN RESONATEUR D'HELMHOLTZ A PAROIS DEFORMABLES EN PRESENCE D'ECOULEMENT HYDRODYNAMIQUE EN TUNNEL] c02
Daniel Leducq *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 6 p In FRENCH (For primary document see N82-22957 13-71)
Avail: NTIS HC A08/MF A01

Acoustic coupling in a hydrodynamic tunnel with two dimensional flow over a cavity was studied. At low frequencies, flow pressure from the opening which introduces the two dimensional flow (A) is in a phase at distances of up to several dia. A. Tunnel-cavity coupling conditions are equivalent to those for two linked Helmholtz generators. The effect of varying opening geometries was tested. Pressure peaks at coupling are reduced by stabilizing shear flow at the opening. The coupling does not disappear entirely, since turbulent flow above the opening still contains local pressure fluctuations with coupling inducing frequencies. Author (ESA)

N82-22975# Lisbon Univ. (Portugal). Ist. Superior Technico.
ON THE PROPAGATION OF SOUND IN NONUNIFORM, LOW MACH NUMBER NOZZLE FLOWS
L. M. B. C. Campos *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 8 p (For primary document see N82-22957 13-71)
Avail: NTIS HC A08/MF A01

Sound propagation in jet aircraft nozzles is analyzed. Propagation up or downstream in convergent or divergent nozzles, cross sectional ratios up to two orders of magnitude, high, intermediate and low frequencies, for which the cross section varies slightly or substantially over a wavelength, and propagation over a few or many wavelengths are considered. The high frequency approximation (WKB), law can be applied to predict the sound amplitude with small errors. For phase, the WKB approximation leads to significant errors for low frequencies or long distances. For energy intensity and flux, the WKB approximation is used to predict sound levels, apart from interference effects. Author (ESA)

N82-22976# Societe Nationale Industrielle Aerospatiale, Toulouse (France).
AIRCRAFT AERODYNAMIC NOISE DURING APPROACH [BRUIT AERODYNAMIQUE DES AVIONS EN APPROCHE]
J. L. Parant *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 3 p In FRENCH (For primary document

see N82-22957 13-71)
Avail: NTIS HC A08/MF A01

The effect of approach velocity, nose and flap inclination, and undercarriage position on aircraft noise was studied. The A 300 B and SN 601 aircraft made two approach passes over a chain of noise recorders. The sound fields and noise spectra show that increasing the speed and flap angle or lowering the undercarriage produces a general increase in noise level such that the directivity of the aerodynamic noise source is hardly changed. All noise spectra increase. Pure frequencies (400 to 500 Hz) accompany flap deployment for the SN 601.
Author (ESA)

N82-22977# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
DEFNINITION OF THE CONVERGENT AND PICKUP SECTIONS OF THE CEPRA 19 ANECHOIC WIND TUNNEL FROM TESTS ON AN 8:100 SCALE MODEL [DEFINITION DU CONVERGENT ET DE LA REPRISE DE LA SOUFFLERIE ANECHOIQUE CEPRA 19 A PARTIR D'ESSAIS SUR UNE MAQUETTE AU 8/100] **c09**
P. Rebuffet and A. Guedel *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 4 p refs In FRENCH (For primary document see N82-22957 13-71)
Avail: NTIS HC A08/MF A01

Aerodynamic and acoustic tests were performed on a model wind tunnel to determine the geometry best suited to 2 and 3 m dia streams. Low frequency noise at certain flow velocities and configurations was studied. The noise were characterized by resonances linked to aeroacoustic coupling in the 130 to 200 Hz range, full scale. The influence of jet length and diameter was examined by a standard test configuration. The resonances are caused by edgetone produced by jet impact on the tunnel sides. A jet 5.42 m long was tested in the full scale tunnel. Results confirm model predictions that this longer than usual jet does not produce velocity fluctuations, and keeps noise to acceptable levels. Author (ESA)

N82-22978# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
EXPERIMENTS ON PROPELLER NOISE
F. R. Grosche and H. Stiewitt *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 4 p refs (For primary document see N82-22957 13-71)
Avail: NTIS HC A08/MF A01

Propeller sound generation was investigated. Tests were performed at flow velocities up to 58 m/sec on 90 cm dia. four bladed propellers driven by an electric motor enclosed in a streamlined nacelle. Five models with different blade geometries were tested at helical tip Mach numbers up to 0.69. Nearfield blade tip measurements were made at 0.14 dia. by an in-flow microphone. The acoustic far field was measured by four microphones outside the wind tunnel flow 2.7 m from the propeller axis. An acoustic mirror telescope with three microphones was used to investigate sound generation from the upper, central and lower parts of the propeller. The spectrum in the propeller plane is dominated by the tonal components at the blade passing frequency and its harmonics. Tonal component amplitude is greatly reduced downstream. The blades radiate high frequency noise mainly in motion direction. Author (ESA)

N82-22979# Societe Bertin et Cie, Plaisir (France).
AEROACOUSTIC AND AERODYNAMIC EXCITATION IN A PIPE NETWORK WITH ANGULAR PITTING [EXCITATION AERODYNAMIQUE ET AEROACOUSTIQUE DANS LES RESEAUX DE TUYAUTERIES AVEC PIQUAGES ANGULAIRES]
G. Regis (Commissariat a l'Energie Atomique, Saclay, France), J. P. Allioud, J. B. Nicolet, and M. Roulin *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 5 p In FRENCH (For primary document see N82-22957 13-71) (PUB-81/07) Avail: NTIS HC A08/MF A01

The increase in vibration of gas pipes after a certain flow velocity is exceeded was investigated. Transient aerodynamic phenomena generated by pitted parts were studied by flow visualization in a hydrodynamic tunnel and by hot wire probes and pressure sensors in an air model. Phenomena discovered were simulated in air models to test solutions. Partitioning the angled piping eliminates the problem, which is caused by vortices formed in the dead space of branching pipes. Author (ESA)

N82-22980# Karlsruhe Univ. (West Germany). Inst. fuer Stroemungslehre und Stroemungsmaschinen.
EXPERIMENTAL INVESTIGATION OF AERODYNAMIC NOISE PRODUCTION OF VALVES BY MEASUREMENTS WITHIN THE CONNECTING PIPE
Lutz Paulsen and Karl Otto Felsch *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 4 p refs (For primary document see N82-22957 13-71)
Avail: NTIS HC A08/MF A01

The mechanism of noise production was studied, varying volumetric velocity, pressure drop, and valve shape and size. The separation of sound and pseudosound is realized by extensive investigation of correlation functions. The noise spectra are characteristic for the shape of the valve. The highest sound pressure at the dominating Strouhal number is a proportion of the pressure drop and the square of mean velocity in the slot. The sound power is predicted by hot wire analysis of the Lighthill tensor. Author (ESA)

N82-22981# Peutz et Associes, Paris (France).
NOISE REDUCTION IN COOLING SYSTEMS FOR GLASSBLOWING MACHINERY [REDUCTION DU BRUIT DE SYSTEMES DE REFROIDISSEMENT DE MACHINES A SOUFFLER LE VERRE]
W. M. Schuller and M. Louwers *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 5 p refs In FRENCH (For primary document see N82-22957 13-71)
Avail: NTIS HC A08/MF A01

Noise levels at work stations in a glassblowing factory were measured and predicted theoretically in order to assess the theory given the small diameter of cooling pipes and to find ways of reducing the noise. Noise spectra distribution was examined. The effects of jet velocity and directivity on noise were studied. Maximum frequency does not correspond to that calculated for the given Strouhal number (0.2), nor does it depend on jet velocity. Spectral distribution is less pronounced than the literature predicts. Monopolarity dominates at low velocity, quadripolarity at high. Maximum sound level occurs at angles between 15 and 30 deg from jet axis. At high velocity, jet noise is supplemented by impact noise. Noise reductions of 10 to 15 db are achieved by decreasing jet velocity and by better positioning of the jets. Author (ESA)

N82-22982# Southampton Univ. (England). Inst. of Sound and Vibration Research.
SOUND GENERATION, PROPAGATION AND RADIATION FROM FLOW DUCTS
P. O. A. L. Davies *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 3 p refs (For primary document see N82-22957 13-71)
Avail: NTIS HC A08/MF A01

Sound features in flow ducts where the Helmholtz number of the component waves is < 1.5, so that plane waves dominate, are discussed. Higher order modes are present locally, e.g., near discontinuities. Piston engines, compressors, and hydraulic equipment are considered. Energy transport is reliably predicted by linear models, even through many processes observed at discontinuities are nonlinear. Local acoustic fields are completely described by local values of wave component amplitudes, relative phase, local sound speed magnitude, mean local density and mean flow velocity. Author (ESA)

N82-22983# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Experimentelle Stroemungsmechanik.
INTERACTION OF THE ACOUSTIC BOUNDARY LAYER WITH TURBULENT FLOW
G. Hoehler *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 4 p refs (For primary document see N82-22957 13-71)
Avail: NTIS HC A08/MF A01

Sound attenuation in flow ducts with rigid walls was examined. A pure shear wave with large acoustic boundary layer thickness was excited by streamwise oscillations of the wall of an oil tunnel carrying a two dimensional fully developed turbulent flow

with a thick viscous sublayer. A hot-film probe measured the streamwise component of the velocity. Relative to the oscillating wall, a phase averaging procedure gives magnitude and phase of the fluctuating velocity of the shear wave propagating into the turbulent flow. Dividing the shear stress by the shear rate yields the 'effective' viscosity, which consists of the molecular viscosity and the eddy viscosity. Further information is obtained by calculating the turbulent component of the oscillating shear stress. The modulation of bursts by the shear wave plays a dominant role in the production and propagation of the oscillating part of the turbulent shear stress. Author (ESA)

N82-22984# Ecole Centrale de Lyon (France). Lab. de Mecanique des Fluides et d'Aeroacoustique.

SPACE-TIME CORRELATIONS OF AN ACOUSTIC WAVE WHICH CROSSES A TURBULENT JET [CORRELATIONS SPATIO TEMPORELLES POUR UNE ONDE ACOUSTIQUE AYANT TRAVERSE UN JET TURBULENT]

P. Blanc-Benon and D. Juve *In its* Euromech 142: Acoustics of Turbulent Flows 1981 4 p refs In FRENCH (For primary document see N82-22957 13-71)

Avail: NTIS HC A08/MF A01

The statistical properties of a monochromatic ultrasonic beam were studied at two points after it crossed a turbulent jet in order to assess the influence of atmospheric turbulence on sound wave propagation, especially on beam coherence. A 20 to 100 kHz transmitter was broadcasted across a turbulent jet, issuing from a rectangular nozzle into an anechoic chamber. Average jet velocity in the test section (150 cm from the outlet) varied from 5 to 12 m/sec. Two microphones perpendicular to the jet axis, outside the turbulent zone, recorded sound pressure. Measured coherence loss agrees with that calculated by parabolic approximation. The intercorrelation of a 10 m/sec average jet velocity, a 50 kHz signal, and 2.1 microsec maximum time lag, gives a transverse velocity = 19 m/sec. Author (ESA)

N82-22985# Southampton Univ. (England). Inst. of Sound and Vibration Research.

MODAL POWER DISTRIBUTION IN DUCTS AT HIGH FREQUENCIES

S. M. Baxter and C. L. Morfey *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 3 p refs (For primary document see N82-22957 13-71)

Avail: NTIS HC A08/MF A01

A statistical method for investigating modal sound power distribution at frequencies where resolving individual modes proves impractical is proposed. With frequency increase, the many mode sound field in an enclosure can approach an asymptotic form, a free wave sound field. This happens in a rectangular hard walled duct, away from the boundaries, if the modes are uncorrelated and the frequency is such that modal sums can be approximated by integrals. For circular hard walled ducts, modal power must only be of modal cut-off frequency. The power distribution is treated as a continuous function of modal coordinates. The finite number of experimental data limits the modal resolution of the power distribution, but does not limit the number of propagating modes considered. Author (ESA)

N82-22986# Cambridge Univ. (England).

AN ADAPTIVE DIGITAL FILTER FOR BROADBAND ACTIVE SOUND CONTROL

C. F. Ross *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 4 p refs (For primary document see N82-22957 13-71)

Avail: NTIS HC A08/MF A01

An algorithm which uses the signal from a monitoring microphone to adjust the controller characteristic is presented. The optimal characteristic is obtained quickly due to the rapid convergence of the algorithm. The scheme was used to control the sound transmitted in a wind tunnel, having a flow with Mach number 0.1. The adaptive scheme can cope with large variations in flow velocity and consequent changes in characteristics required to maintain optimal performance. The attenuation in sound level achieved in the duct came within 2 db of the theoretical maximum (which is limited by coherence) over more than two octaves of broadband sound. Author (ESA)

N82-22987# Admiralty Underwater Weapons Establishment, Portland (England).

MUTUAL IMPEDANCE EFFECTS IN ACTIVE NOISE CONTROL AND THE POSSIBILITY OF EXTRACTING ENERGY FROM TURBULENCE

Ian Roebuck *In* Ecole Centrale de Lyon Euromech 142: Acoustics of Turbulent Flows 1981 4 p refs (For primary document see N82-22957 13-71)

Avail: NTIS HC A08/MF A01

Causality and the applicability of superposition in active noise control and in the interaction of a prescribed acoustic field with turbulence are discussed. The paradox of where the energy goes when, in active control, the controlling secondary source is switched on, decreasing the total radiated power, is addressed. The fact that turbulence and acoustic fields cannot be prescribed independently without leading to fields with effects apparently anticipating later events is treated. The difficulties result from assuming that the power output from a source is invariant under operation or otherwise of a second source. The comparison between a monopole, a dipole, and a double amplitude monopole demonstrates that the effective impedance of a source is a function of all other sources in the system. Also, the reactive influence of the acoustic medium is often neglected, especially in aeroacoustics. Author (ESA)

N82-22988# Ecole Centrale de Lyon (France).

ACTIVE ACOUSTIC ABSORPTION DUCTS WITH TURBULENT FLOW [ABSORPTION ACOUSTIQUE ACTIVE DANS LES CONDUITS AVEC ECOULEMENT TURBULENT]

A. Roure (L.M.A., Marseille) and M. Sunyach *In its* Euromech 142: Acoustics of Turbulent Flows 1981 2 p In FRENCH (For primary document see N82-22957 13-71)

Avail: NTIS HC A08/MF A01

The effect of fluctuations in the time a sound wave takes to travel between the sound reduction system and the microphone measuring sound pressure in typical active control systems was investigated. Signals and their reflections were sampled at 100 kHz in a 10 cm rectilinear duct by a digital system. Flow velocity and incident wave amplitude were noted. The main effect results from the contamination of the sound pressure signal by the hydrodynamic component. In unfavorable cases, the spread of delay fluctuations corresponds to phase fluctuations of several degrees. Author (ESA)

N82-22989# Energy and Minerals Research Co., Exton, Pa.

ULTRASONICALLY ENHANCED SIZE REDUCTION OF COAL Quarterly Technical Progress Report, 25 Jun. - 25 Sep. 1981

W. B. Tarpley, Jr. and H. M. Stephey Oct. 1981 14 p (Contract DE-AC22-81PC-42268)

(DE82-001601; DOE/PC-42268/T1; QTPR-1) Avail: NTIS HC A02/MF A01

The beneficial effects of ultrasonic coal comminution on a controlled laboratory scale, grinding selectivity and power requirements are discussed. The experimental work is shows that: (1) energy efficiency can be improved; (2) abrasive wear on the system will be reduced; (3) preferential fracture will reduce product size extremes; (4) and selective fracture may allow harder inclusions (ash and pyrites) to remain unaltered for easing screening. DOE

N82-22990# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Technische Akustik.

GROUND REFLECTION EFFECTS IN MEASURING PROPELLER AIRCRAFT FLYOVER NOISE

Werner Dobrzynski Aug. 1981 85 p refs In GERMAN; ENGLISH summary Report will also be announced as (ESA-TT-742)

(DFVLR-FB-81-28; ESA-TT-742) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 21

In measuring flyover noise for purposes of propeller aircraft noise certification, microphones are positioned 1.2 m above the ground. The influence of ground reflection on the maximum A weighted aircraft noise level was investigated. Ground reflection induces level differences of up to 3 db (A), depending on rotational speed and number of blades. Since reflection corrections can not successfully be applied to propeller noise signatures,

alternative measuring arrangements, such as microphones in close proximity to the ground, were investigated. For different microphone orientations next to an acoustically hard, smooth surface, or above ground plates in case of grass covered surfaces, frequency regimes not affected by ground reflection interferences are determined. Author (ESA)

N82-22991# Centre National de la Recherche Scientifique, Marseilles (France). Lab. de Mecanique et d'Acoustique.
[ACTIVITIES REPORT OF THE MECHANICS AND ACOUSTICS LABORATORY] Annual Report, 1979 - 1980 [RAPPORT D'ACITIVITE 1979 - 1980]
1980 90 p refs In FRENCH
Avail: NTIS HC A05/MF A01

Research in theoretical and applied mechanics and acoustics is reported. Work on applications of mathematical models, structural analysis and vibration effects is summarized. Psychoacoustics is introduced and the use of computers in the study of music are discussed. Sound wave propagation, ultrasonic testing and the acoustics of concert halls are treated. Author (ESA)

N82-22992# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
EXPERIMENTAL INVESTIGATION OF SELF-EXCITED, SOUND EMITTING FLAMES CONSIDERING VORTEX RING INSTABILITY [EXPERIMENTELLE UNTERSUCHUNG VON SELBSTERREGTEN KLANGABSTRAHLENDEN FLAMMEN UNTER BERUECKSICHTIGUNG DER RINGWIRBELINSTABILITAET]
Peter E. M. Schneider Aug. 1981 151 p refs In GERMAN (MPIS-13/1981; ISSN-0436-1199) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 25,90

The sound spectra of a self excited sound sensitive flame were investigated as a function of the gas flow, Q. The flame burned above a burner with slotted tip outlet. Frequency jumps in the fundamental tone subdivide the emitted flame sound in the investigated flow range, into four domains: (1) frequency domain of the noiseless laminar flame lobe just at the burner outlet (Q from 1040 to 1120 cu cm/min) with a vortex frequency range from 0 to 160 Hz; (2) frequency domain (from 315 to 800 Hz) of the sound emitting harmonic flame (Q from 1120 to 1300 cucm/min) removed from the burner outlet and consisting of two lobes; (3) frequency domain (from 1.6 to 4 kHz) of the sound emitting harmonic flame (Q from 1340 to 2160 cu cm/min) removed from the outlet and consisting of three lobes; and (4) the frequency domain of the noise emitting turbulent flame (Q > 2160 cucm/min) showing a variable number of lobes. Around Q = 2160 cu cm/min the three sound emitting flame types can be observed and the flame jumps spontaneously between noise emitting turbulent state and sound emitting harmonic states, or converts from these two states into the noiseless laminar state. Author (ESA)

N82-22993# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abt. Technische Akustik.
ACOUSTIC EVALUATION OF THE AGUSTA 109A HELICOPTER IN COMPLIANCE WITH THE PROPOSED ICAO ANNEX 16/CHAPTER 8 REGULATIONS
Wolf R. Splettstoesser and Srinivasa R. Nagaraja (Costruzioni Aeronautiche Giovanni Agusta S. p. A., Gallarate, Italy) Sep. 1981 122 p refs In GERMAN; ENGLISH summary
(DFVLR-Mitt-81-24) Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 32,50

Noise measurements on the AGUSTA 109A helicopter were performed in order to determine the effective perceived noise levels (EPNL) in compliance with proposed regulations; investigate flight altitude effects on EPNL; and evaluate the effect of different takeoff power settings on EPNL. EPNL values for operational modes are close to the proposed noise limits. For takeoff and approach the EPNL values are 1 EPNdb below, for flyover 1.6 EPNdb above the noise limits. After applying the tradeoff regulation, the A 109A complies with the proposed noise certification rules. A possible uncertainty in the measured takeoff values may result from a significant airspeed excess at the takeoff test flights. Unfavorable wind conditions with mean velocities up to 9 knots possibly affected the approach results. Noise measurements under more favorable weather and test conditions are recommended. Author (ESA)

N82-22162# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
ACOUSTIC NOISE TEST AS PART OF THE DYNAMIC QUALIFICATION PROGRAM IN AEROSPACE
G. Bayerdoerfer *In* AGARD Dyn. Environ. Qualification Tech. Dec. 1981 7 p (For primary document see N82-22154 13-01)
Avail: NTIS HC A11/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N82-22994*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MATHEMATICAL ANALYSIS OF THE PHOTOVOLTAGE DECAY (PVD) METHOD FOR MINORITY CARRIER LIFETIME MEASUREMENTS
O. H. vonRoos 15 Feb. 1982 14 p refs
(Contract NAS7-100; DE-AI01-76ET-20356)
(NASA-CR-168821; JPL-Pub-82-3; DOE/JPL-1012-65; NAS 1.26:1688821) Avail: NTIS HC A02/MF A01 CSCL 20H

When the diffusion length of minority carriers becomes comparable with or larger than the thickness of a p-n junction solar cell, the characteristic decay of the photon-generated voltage results from a mixture of contributions with different time constants. The minority carrier recombination lifetime tau and the time constant l(2)/D, where l is essentially the thickness of the cell and D the minority carrier diffusion length, determine the signal as a function of time. It is shown that for ordinary solar cells (n(+)-p junctions), particularly when the diffusion length L of the minority carriers is larger than the cell thickness l, the excess carrier density decays according to exp (-t/tau-pi(2)Dt/4l(2)), tau being the lifetime. Therefore, tau can be readily determined by the photovoltage decay method once D and L are known. M.G.

N82-22995 Rolls-Royce Ltd., Derby (England).
TWO-DIMENSIONAL NEUTRON SPECTRUM CALCULATIONS FOR THE FKS IRRADIATION CAPSULES WITH STEEL SHIELDING IN THE FRG-2
K. Almalah, G. Prillinger, and A. Fischer May 1981 80 p refs Transl. into ENGLISH of Rept. IKE-6-KS-4 Stuttgart Univ., West Germany In ENGLISH and GERMAN
(PNR-90089; Trans-15738/TLT-00831; IKE-6-KS-4)
Copyright. Avail: NTIS HC A05/MF A01

Pressure vessel steel specimens arranged in irradiation capsules of different thickness (CK 60, CK 100 and CK 120) were irradiated. In order to allocate a specific neutron dose to the irradiation specimens, the neutron spectra in the capsules were determined by two dimensional transport calculations. The energy dependence was determined with 31 groups and the angular dependence in an S sub 8/P sub 3 Legendre expansion. The irradiation setup was modelled in an (X,Y) geometry at the power peak with a suitable buckling correction for the Z direction. The calculated neutron spectra were plotted as a function of energy and location. The Frenkel pair formation rates and the meaned cross sections were plotted for the capsules as a function of the location. For CK 60 the neutron spectra and neutron flux curves from one and two dimensional calculations were compared so as to obtain a comparison with the results of one dimensional transport calculations. Author (ESA)

N82-22996# Flinders Univ., Bedford Park (Australia). Inst. for Atomic Studies.
OBSERVING THE MOTION OF ELECTRONS IN ATOMS AND MOLECULES
I. E. McCarthy and E. Weigold Jul. 1981 44 p refs
(DE81-700570; FIAS-R-82) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Properties of different types of molecules obtained by quantum chemistry were calculated. The dynamic electronic

structure of atoms and molecules can be directly observed by the (e,2e) reaction, which measures the distribution of energies and momenta of two electrons in coincidence after a knockout reaction initiated by an electron beam of known momentum incident on a molecular gas target. The molecular state for each event is identified by the electron separation energy. The recoil momentum for each event is known from the difference of measured initial and final momenta. It verified that values of this momentum are equal under suitable conditions to the momentum of the electron in the target immediately before knockout. Thus the spherically averaged electron momentum distribution for each molecular orbital is measured. DOE

N82-22997# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
RADIATION SAFETY CALCULATIONS FOR RESIDUAL RADIATION IN DWELLING [STRAALSKYDDSBERAEKNINGAR FOER KVARVARANDE STRAALNING FOER NAAGRA BOSTADSHUS]
Goeran Danielson Mar. 1981 20 p refs In SWEDISH
(FOA-C-30402-A3) Avail: NTIS HC A02/MF A01

Safety calculations for remaining radiation after reactor accident at different locations in townhouses and apartment buildings are presented. The safety factor for one and two story townhouses was calculated to be 0.4 for wooden houses and 0.2 for stone houses. The safety factors for six story apartment buildings were 0.01-0.12, depending on location. J.M.S.

N82-22998# Stockholm Univ. (Sweden). Inst. of Physics.
DESCRIPTION OF AN ANTIPION PROTON BUBBLE CHAMBER EXPERIMENT AT 4 GeV/c INCIDENT MOMENTUM
S. Rodebaeck, I. Sjoegren, S. O. Holmgren, and C. Walck Mar. 1981 32 p refs Sponsored by Swedish Science Research Council
(USIP-81-05) Avail: NTIS HC A03/MF A01

A 2m hydrogen bubble chamber was exposed to a beam of negative pions at an average incident momentum of 3.95 GeV/c. Amplitude analyses of quasi two body reactions with hypercharge exchange were carried out and properties of meson resonances were studied. The exposures are described and details of the scanning and measurements are given. The geometry and kinematics processing are explained, including a method to determine beam parameters (kinematic data processing) and a correction method for distortions in the ionization information from the bubble chamber and measurement device. A weighting procedure for the events which accounts for detection losses is outlined and the calculated topological cross sections are presented. Author (ESA)

N82-22999# Stockholm Univ. (Sweden). Inst. of Physics.
LIGHT HIGGS BOSONS AT LEP
G. Ekspong Nov. 1981 7 p refs Presented at COLLEPS Meeting, Cern, Sweden, 19 Jan. 1981
(USIP-81-09) Avail: NTIS HC A02/MF A01

Validation of the existence of the Higgs boson, predicted in gage theories of electroweak interactions, is discussed. Among possible production reactions for neutral Higgs bosons, it is known that (positron electron yields neutral Z boson + neutral Higgs boson) offers advantages of relatively high production cross section and low background from other reactions. With neutral Z boson decaying to two electrons, which was measured, the existence of a Higgs candidate could be seen as a peak in the missing mass spectrum. It was shown that a sufficiently good mass resolution was obtainable to make a search for Higgs feasible at LEP. In its first phase, the energy of LEP limits the search to Higgs bosons of mass around 10 GeV. Author (ESA)

N82-23000# Science Research Council, Chilton (England).
GLUEBALLS, HERMAPHRODITES AND QCD PROBLEMS FOR BARYON SPECTROSCOPY
F. E. Close 1981 19 p refs
(PB82-131236) Copyright. Avail: NTIS HC A02/MF A01 CSCL 20H

Spin orbit splittings in baryon spectroscopy are examined with relevance to QCD. Glueballs sightings are evaluated and the possibility of hermaphrodites (states containing quarks and glue) is mentioned. GRA

N82-23001# Science Research Council, Chilton (England).
A GENERAL ALGORITHM FOR THE RECONSTRUCTION OF JET EVENTS IN E + E ANNIHILATION
M. C. Goddard 1981 19 p refs
(PB82-128794; RL-81-069) Copyright. Avail: NTIS HC A02/MF A01 CSCL 20H

A method for the reconstruction of jets in e(+)e(-) annihilation is described. The formation of jets is described, as predicted by the theory of Quantum Chromodynamics (QCD). This will make clear the importance of jet reconstruction algorithms as tools in testing the predictions of QCD. Existing methods are briefly outlined, and their limitaions are clarified. The iterative method employed by this algorithm is described in detail. Finally, results are presented from the reconstruction of 2-jet, 3-jet and 4-jet Monte Carlo events. GRA

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N82-23002# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
MATERIALS SCREENING TESTS FOR THE KRYPTON-85 STORAGE DEVELOPMENT PROGRAM Final Report
P. K. Nagata Exxon Nuclear Idaho, Co., Inc. Apr. 1981 84 p refs
(Contract DE-AC07-79ID-01675)
(ENICO-1081) Avail: NTIS HC A05/MF A01

The results of a materials testing program for krypton-85 storage techniques are reported. Corrosion and stress corrosion tests were performed on a variety of materials including AISI 4130, Type 316 SS, Type 304 SS, Type 310 SS, Nitronic 50, and alloy A286. Test environments were high-purity liquid rubidium, liquid rubidium contaminated with oxygen, and rubidium hydroxide. Oxygen and water contaminations in liquid rubidium were found to greatly increase both general and localized corrosion of the materials tested. Alloy A286, Type 304 SS, and AISI 4130 were eliminated as candidate materials due to their susceptibility to general corrosion and stress corrosion cracking. Author

N82-23003*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HARMONIC WELL MATTER DENSITIES AND PAULI CORRELATION EFFECTS IN HEAVY-ION COLLISIONS
Lawrence W. Townsend Apr. 1982 31 p refs
(NASA-TP-2003; L-15105; NAS 1.60:2003) Avail: NTIS HC A03/MF A01 CSCL 20H

A generalized optical model heavy ion reaction theory is extended to include correlation effects between projectile and target constituents according to the Pauli exclusion principle. These correlation effects are significant for accurately predicting cross sections for projectile nucleus abrasions, but are relatively unimportant for determining total and absorption cross sections for heavy ion collisions. For lighter nuclei, predictive capabilities were also improved by developing an analytic method for extracting their nuclear single particle density distributions from experimentally measured harmonic well charge density distributions. This improved theory is compared with previous theoretical predictions and recent experimental results. S.L.

N82-23004# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. de Physique du Plasma et de la Fusion Controlee.
EXPERIMENTAL AND NUMERICAL STUDIES OF THE FAST IONS CONFINED IN TFR 600 DURING FAST NEUTRALS INJECTION
B. Gagey Aug. 1980 36 p
(EUR-CEA-FC-1063) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

A comparison between experimental fast neutrals spectrum measured with a very simple electrostatic analyzer which was

absolutely calibrated is presented. Spectra obtained during fast neutrals' injection in TFR 600, and numerical fast neutrals' spectrum obtained from a modified Monte Carlo calculation code, are presented. This comparison allows drawing important conclusions on the fast ions' behavior in the plasma. DOE

N82-23005# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. de Recherches sur la Fusion Controlee.
PHYSICS ASPECTS AND TECHNICAL ELEMENTS OF AN ICRF HEATING SYSTEM FOR JET
J. Adam, J. Jacquinot, and H. Kuus Sep. 1980 56 p refs
(EUR-CEA-FC-1065) Avail: NTIS (US sales only) HC A04/MF A01; DOE Depository Libraries

A heating system for jet in the ion cyclotron range of frequency was studied. The main physics and technical elements of a complete system for JET, e.g., from the fundamental damping mechanisms of the wave in the plasma to the outline of the RF power plant were described. An overview of the recent results obtained in existing Tokamaks is presented. These experiments offer a critical test of the basic physics ideas, give an estimate of the overall heating performance and show the degree of development of the RF hardware. Basic wave particle physics is emphasized. A second part is devoted to the basic wave-particle physics. JET works in a wide variety of plasma parameters which constitutes an unprecedented constraint. A range of frequency was found which accomodates, within limits, most of the operating scenarios. DOE

74 OPTICS

Includes light phenomena.

N82-23006 Rochester Univ., N. Y.
IMAGE EVALUATION AND OPTIMIZATION IN ZONE PLATE CODED IMAGING Ph.D. Thesis
Franklin Dean Kalk 1981 153 p
Avail: Univ. Microfilms Order No. 8123982

Although zone plate coded imaging (ZPC) is a useful technique for imaging X-ray and particle emissions from laser-produced plasmas, image evaluation and optimization require study. A simple categorization scheme for optical coded imaging systems is presented and ZPCI is equated with a multiple exposure holographic process to easy analysis of the reconstruction step. Image degradation is classified as either deterministic (artifacts) or random (noise). Nonlinear ZPCI is treated for both absorption and phase reconstructions. Reconstruction mask density effects and object spatial frequency content are considered. Noise is coupled to the image field and peaks at low frequencies and shot noise is treated and compared with grain noise. Linear ZPCI is shown to have better image fidelity than nonlinear ZPCI in the X-ray region. The variation of artifacts with image size is also demonstrated. Qualitative studies of grain noise verify that phase reconstructions have higher SNR than absorption reconstructions. The variation of SNR with object size is also shown. Dissert. Abstr.

N82-23007*# American Science and Engineering, Inc., Cambridge, Mass.
THE APPLICATION OF SOFT X-RAY IMAGING TECHNIQUES TO AURORAL RESEARCH Final Report
30 Jun. 1981 79 p refs
(Contract NASw-3426)
(NASA-CR-168767; NAS 1.26:168767; ASE-4649) Avail: NTIS HC A05/MF A01 CSCL 20F

The feasibility of building and operating a grazing incidence X-ray telescope for auroral zone studies from the Polar Plasma Laboratory (PPL) is discussed. A detailed structural analysis of the preferred design, an array of seven nested Wolter mirrors, is presented. An engineering evaluation of the requirements for the instrumental configuration, power, weight and telemetry is included. The problems of radiation hardening and thermal control are discussed. The resulting strawman instrument is presented. S.L.

N82-23008*# Dartmouth Coll., Hanover, N.H. Dept. of Physics and Astronomy.
OPTICAL CONDUCTIVITY OF ALPHA-Mn
K. J. Scoles and R. W. Christy [1982] 12 p refs Sponsored by NASA
(NASA-CR-168761; NAS 1.26:168761) Avail: NTIS HC A02/MF A01 CSCL 20F

The optical constants were measured at room temperature in the photon-energy range 0.6 to 6.5 eV on evaporated thin films. Evaporation conditions were chosen that gave the alpha-Mn crystal structure with reasonably large grains. The optical conductivity was separated into intraband and interband contributions by fitting to the Drude formula at low energies. The results are anomalous in comparison to other 3d transition metals. The free-electron lifetime is exceptionally sort (in agreement with the large dc resistivity of Mn), and the interband transitions seem unusually weak at the lower energies. Possible explanations related to the complicated crystal structure of alpha-Mn are discussed. Author

N82-23009*# Dartmouth Coll., Hanover, N.H. Dept. of Physics and Astronomy.
OPTICAL CONDUCTIVITY OF AMORPHOUS Ta AND BETA-Ta FILMS
J. E. Nestell, Jr., K. J. Scoles, and R. W. Chrisoy [1982] 29 p refs Sponsored by NASA
(NASA-CR-168762; NAS 1.26:168762) Avail: NTIS HC A03/MF A01 CSCL 20F

Tantalum films evaporated in high vacuum onto liquid-nitrogen-cooled substrates had an amorphous structure that persisted even after warming to room temperature. The optical conductivity (as well as the dc conductivity) of the amorphous films differed significantly from that of the bcc films. N.W.

N82-23010# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
ROK: AN INTERACTIVE COMPUTER PROGRAM FOR OPTICAL TRANSMISSION THROUGH SMOKE TRAILS. DESCRIPTION OF ROUTINES FOR CALCULATING AND FOR LEVEL CHARTS [ROK - ETT INTERAKTIVT DATORPROGRAM FOER OPTISK TRANSMISSION GENON ROEK. BESKRIVNING AV RUTINER FOER BERAEKNINGAR OCH FOER GRAFISK PRESENTATION AV NIVAAKURVOR]
Lars Bjoerklund, Akos Koranyi, and Eva Elvers Mar. 1981 67 p refs In SWEDISH
(FOA-C-20400-E4) Avail: NTIS HC A04/MF A01

The ROK program for calculating optical transmission through smoke is described. The program can describe smoke during its spread and at various diffusion stages, the air layers, and movable targets. Results are presented graphically at any given time. The physical background, the mathematical formulation, and an example of the application of the program are presented. J.D.

N82-23011# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
STATUS REPORT AND OUTLOOK FOR DEFENSE APPLICATIONS OF ELECTRO-OPTICAL SYSTEMS, INFRARED, LASERS AND RELATED TECHNOLOGIES [RAPPORT FRAAN EN KONFERENS MED TITELN 'STATUS REPORT AND FUTURE OUTLOOK FOR DEFENCE APPLICATIONS OF ELECTRO-OPTICAL SYSTEMS, INFRARED, LASERS AND RELATED TECHNOLOGIES']
Bjoern Nilsson Sep. 1981 21 p Partly in SWEDISH and ENGLISH
(FOA-C-30233-E3) Avail: NTIS HC A02/MF A01

Trends in the development of terminally guided ammunition are summarized. Forward looking infrared designs and equipment, the systems and technology outlook for thermal imaging, portable weapons, airborne forward looking infrared laser pods and mini-remotely piloted vehicles, infrared applications in reconnaissance imaging, and customer requirements and trends for infrared sensors in space are discussed. J.D.

N82-23012 Royal Aircraft Establishment, Farnborough (England). Space Dept.
MARITIME INFRARED PROPAGATION: PARTICLE SIZE DISTRIBUTION MEASUREMENTS USING A HELICOPTER-BORNE AEROSOL COUNTER
R. R. Allan and S. Craig Sep. 1981 23 p refs

(RAE-TR-81111; RAE-Space-604; BR81705) Copyright. Avail: NTIS HC A02/MF A01

The effect of atmospheric aerosol content over shallow water on IR propagation was studied in order to see if it differed from that over deep water. Particle size distribution was measured on 9 successive days during helicopter flights at 30 and 100 ft above the sea surface, extending from a measurement site on an island, out over the sea to a distance of 20 km. The aerosol content over the shallow water near the island does not differ significantly from that over deep water. The importance of air mass history and the value of the radon counting technique in corroborating conclusions is emphasized. Author (ESA)

N82-23013# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.

MOMS: THE MODULAR OPTO-ELECTRONIC MULTISPECTRAL SCANNER PROGRAM DEVELOPMENT

Breitenstein 1980 17 p refs Presented at DGLR/AAS Symp. on Shuttle/Spacelab: The New Transportation System and its Utilization, Hanover, Apr. 1980

(MBB-UR-491-O; DGLR-80-092) Avail: NTIS HC A02/MF A01

The Modular Optoelectronical Multispectral Scanner (MOMS) is described with emphasis on the advantages of this multispectral camera over the LANDSAT MSS. Modifications of the basic system, stereo modules and infrared modules, are also included. It is proposed that the MOMS system is capable of producing three dimensional orthophotographic maps in the scale of 1:50,000. The provision for onboard data processing is also addressed. J.M.S.

N82-23014# AEG-Telefunken, Ulm (West Germany). Forschungsinst.

DIGITAL FIBER OPTIC COMMUNICATION SYSTEMS WITH STUDY EMPHASIS ON THE RECEIVER END Final Report Apr. 1980

Franz Bross, Johann Gruber, Hans-Joachim Heyke, Michael Holz, Ernst Kremers, Peter Marten, Artur Muessigmann, Manfred Ottka, Reinhard Petschacher, Roman Sobkowiak et al Bonn Bundesministerium fuer Forschung und Technologie Jan. 1982 140 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-82-005; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 29,40

Digital fiber optic communication system optimum performance was examined. On the receiver side, line codes and low noise front end amplifiers were studied. Circuits for signal and clock regeneration, for gain control of the photodiode, and for demultiplexing were designed, realized, and investigated for use at 1 Gbit/sec. Receivers for 140 Mbit/sec, 280 Mbit/sec, and 1 Gbit/sec were built and optimized. For the transmitter, 4 x 250 Mbit/sec to 1 Gbit/sec multiplexers and laser drivers, having rise times below 200 psec were developed. A laser control circuit was fabricated and investigated at 1 Gbit/sec. The Gbit/sec circuits, using hybrid integrated thin film technology, were simulated by a digital computer. Error rate measurements were carried out at 1 Gbit/sec over a 1.6 km single-mode fiber. For a bit error rate of 10 to the -9th power, an average input power of -30.8 dBm is shown. Author (ESA)

N82-23015# Standard Elektrik Lorenz A.G., Stuttgart (West Germany). Forschungszentrum.

OPTICAL COMMUNICATION SYSTEM FOR WAVELENGTHS AROUND 1200 NM Final Report, Aug. 1981

Wolfgang Borowski, Reimund Dorn, Kurt Hess, Kurt Loesch, and Gerald Schemmel Bonn Bundesministerium fuer Forschung und Technologie Feb. 1982 78 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-82-012; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16,40

A fiber optical communication system with a maximum fiber length of 36 km, without a repeater, was developed. The electro-optical effect was studied and an operating wavelength of 1200 nm was chosen, due to the low attenuation of glass fibers in this spectral region. For the source and reception ends, an SiO2 strip laser and photodetector were fabricated, using liquid phase epitaxy and vacuum deposition. Drive and signal reception amplifying circuitry was also designed. With these components and a low loss gradient fiber, a laboratory model was set up. At 34 Mbit/sec transmission rate, a bit error rate of 10 to the minus 9th power is shown. Author (ESA)

N82-23016# Engins Matra, Velizy (France).

STUDY OF A FIBER OPTICS, SIGNAL TRANSMISSION LINE

Herve Hyguenin 7 Jan. 1982 59 p refs In FRENCH

(DEL-HH-760) Avail: NTIS HC A04/MF A01

Components necessary for constructing an optical communication line were studied in order to theoretically evaluate the performance of a 16 channel, pyramid structure bus. The IR power losses at the fiber couplings with the source and receptor diodes as well as at the connectors and Y-junctions were estimated. The entire transmission line was evaluated, given the electro-optical characteristics of the data converters. Qualitatively, using three couplers, optical attenuation does not significantly degrade the signal to noise ratio, while the rectangular signals transmitted at 2 MHz are not distorted. Quantitatively, the theoretical performance estimation of an optical, pyramid structure bus is confirmed. However, losses at the connectors are greater than foreseen. Author (ESA)

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N82-23017# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.

ION GYROHARMONIC PLASMA WAVE FEATURES ASSOCIATED WITH ION CONICS

David J. Gorney, P. F. Mizera, and S. R. Church (California Univ., Los Angeles) 26 Jun. 1981 15 p refs

(Contract F04701-80-C-0081; Grant NSF ATM-80-00518)

(ATR-81(7883)-1) Avail: NTIS HC A02/MF A01

Evidence is presented from the energetic particle and AC wave measurements aboard the low-altitude S3-3 spacecraft that the harmonic structure of ion cyclotron harmonic (ICH) waves is due to cyclotron resonant energy absorption near ion gyroharmonic frequencies by energetic auroral ions. A.R.H.

N82-23018# Flinders Univ., Bedford Park (Australia). School of Physical Sciences.

EXPERIMENTAL INVESTIGATION OF CURRENT PRODUCTION BY MEANS OF ROTATING MAGNETIC FIELDS

W. N. Hugrass, I. R. Jones, and M. G. R. Phillips Aug. 1980 29 p refs

(FUPH-R-168) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

An investigation of current production by means of a rotating magnetic field was made in an experiment in which the technique was used to generate theta pinch like distribution of field and plasma. Detailed measurements were made of both the generated unidirectional azimuthal electron current and the penetration of the rotating field into the plasma. The experimental results support the theoretical prediction that a threshold value of the amplitude of the applied rotating field exists for setting the electrons into rotation. DOE

N82-23019# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. de Recherches sur la Fusion Controlee.

CODE FOR THE EVOLUTION OF IMPURITIES IN A STATIONARY PLASMA (WITH THE CORONAL HYPOTHESIS)

H. Capes, G. Cissoko, D. Haquang, C. Mercier, and J. P. Morera May 1981 50 p refs In FRENCH

(DE81-700588; EUR-CEA-FC-1102) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Two MED equation independent codes for the evolution of impurities in a plasma were extracted from the Makokot system. Although various different impurities are present in Tokamak,

only the most commonly encountered were studied: oxygen, carbon, molybdenum and nickel. One of these codes employs the coronal hypothesis; the other code takes the 82 equations corresponding to the different ions of these impurities into consideration. Both programs are currently available and enable the spatio-temporal evolution or each of the different impurity species to be studied for stationary state plasmas. Only one of the models is presented with coronal hypothesis. Significant modifications were introduced into the model in comparison with the original version existing in the Makokot system. These modifications could eventually be introduced into the second model (without the coronal hypothesis) and into the Makokot system itself. DOE

N82-23020# Commissariat a l'Energie Atomique, Grenoble (France). Dept. de Recherches sur la Fusion Controlee.

RAY-TRACING TOROIDAL AXISYMMETRIC DEVICES. 1: THEORETICAL ANALYSIS

A. Cardinali and M. Brambilla Jun. 1981 24 p refs
(DE81-700586; EUR-CEA-FC-1092) Avail: NTIS (US Only Only)
HC A02/MF A01; DOE Depository Libraries

Ray tracing technique for lower hybrid waves was used to obtain informations about accessibility, power deposition profiles, and eventually electric field distribution. A critical discussion to establish the meaning and validity of this technique is presented. Applications to small and large, fat Tokamaks are presented, which support and explain the theoretical arguments. DOE

N82-23021# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. de Physique du Plasma et de la Fusion Controlee.

MICROWAVE SCATTERING STUDY OF THE ION CYCLOTRON WAVE DURING PLASMA HEATING IN THE TOKAMAK Ph.D. Thesis

Bernadette Espitalier Mialet Jun. 1980 138 p refs In FRENCH
(EUR-CEA-FC-1048) Avail: NTIS (US Sales Only)
HC A07/MF A01; DOE Depository Libraries

Microwave scattering measurements were made to analyze the ion cyclotron wave structure during ICRH heating in a Tokamak. In order to study the eventual conversion of the fast magnetosonic wave into a slow wave near the two in hybrid resonance, experiments were performed in a deuterium plasma with hydrogen added as a dopant. Also, the region of the poloidal plane located between the two ion hybrid resonance layer and the ion cyclotron resonance surface ((NU) = (NU)sub(CH) = 2 (NU)sub(CD)) was particularly investigated. Indeed, slow modes are supposed to exist and to experience ion cyclotron and electron Landau damping in this region. The frequency analysis of the power scattered by the electron density fluctuations reveals a forced oscillation regime. The poloidal wave number spectrum allows identification of a fast wave (K (perp.) approximately 1cm(+1) approximately 4(LC OMEGA)/a, where a is the plasma radius), and, for high plasma density (n(0) approximately 1.2 x 10(14)cm/sup -3/1) a slow wave (K(perp.) approximately 5/7 cm/sup -1/) at a weaker level. DOE

N82-23022# Commissariat a l'Energie Atomique, Grenoble (France). Dept. de Physique du Plasma et de la Fusion Controlee.

POWER AND CURRENT GENERATION BY QUASILINEAR ELECTRON ACCELERATION IN STEADY STATE

P. Rolland Feb. 1981 30 p refs
(EUR-CEA-FC-1089) Avail: NTIS (US Sales Only)
HC A08/MF A01; DOE Depository Libraries

The problem of current energy generation by radio frequency waves was investigated. In previous analytical theories, it was assumed that the phase velocity was much larger than the thermal velocity, which allows a one dimensional calculation. The need for an analytical two dimensional theory appears when going beyond the above assumption is desired. Such a calculation is presented for a steady state and a narrow spectrum. DOE

N82-23023# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. de Physique du Plasma at de la Fusion Controlee.

INFRARED THERMOGRAPHY ON TFR 600 TOKAMAK Ph.D. Thesis

Roland Romain Jun. 1980 166 p refs In FRENCH
(EUR-CEA-FC-1058) Avail: NTIS (US Sales Only)
HC A08/MF A01; DOE Depository Libraries

Infrared thermography with a single InSb detector and with a scanning camera was performed on the TFR fusion device. High power neutral beam injection diagnostics by means of an infrared periscope, was shown to be possible. Surface temperature measurements on the limiter during the discharge were made in order to evaluate the power deposited by the plasma on part of the inner wall. Various attempts of infrared detection on the high power neutral injector prototype vessel are described, particularly the measurement of the power deposited on one of the extraction grids of the ion source. DOE

N82-23024# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. de Physique du Plasma et de la Fusion Controlee.

IMPURITY CHARGE-EXCHANGE PROCESSES IN TOKAMAK PLASMAS

M. E. Puiatti, C. Breton, C. Michelis, and M. Mattioli Feb. 1981 38 p refs
(EUR-CEA-FC-1085) Avail: NTIS (US Sales Only)
HC A08/MF A01; DOE Depository Libraries

Charge exchange reactions between multiply charged impurity ions and neutral hydrogen isotopes were considered. Ionization equilibrium and radiative losses were evaluated for oxygen and iron in the presence of either thermal or beam neutrals. The influence of thermal neutrals on recently reported results from chemically heated TFR discharges is also discussed. DOE

N82-23025# Commissariat a l'Energie Atomique, Grenoble (France). Dept. de Physique du Plasma et de la Fusion Controlee.

TECHNICAL STUDY OF TORSIONAL TRANSIT-TIME MAGNETIC PUMPING (TTMP) HEATING. APPLICATION FOR PETULA AND LARGE MACHINES

J. Brossaud, R. Lanier, J. P. Perin, and G. Rey Nov. 1980 80 p refs In FRENCH
(EUR-CEA-FC-1069) Avail: NTIS (US Sales Only)
HC A05/MF A01; DOE Depository Libraries

A computer program is described which determines the RF current distributions and the corresponding voltage and dissipated powers in the conductors for the application of torsional TTMP heating. The results fit well with Petula-scale experiments. Two prototype coils were studied and tested for Petula. The application for JET points out the main technical problems which need further developments to ensure the technical feasibility of this method. DOE

N82-23026# Association Euratom-CEA, Fontenay-aux-Roses (France). Dept. de Recherches sur la Fusion Controlee.

RELATIVE SPATIAL DIFFUSION IN PLASMA AND FLUID TURBULENCES: CLUMPS, RICHARDSON'S LAW AND INTRINSIC STOCHASTICITY

J. H. Misguich and R. Balescu Feb. 1981 50 p refs
(EUR-CEA-FC-1071) Avail: NTIS (US Sales Only)
HC A03/MF A01; DOE Depository Libraries

Three different time regimes are presented for relative spatial diffusion of charged particles in fluctuating electric fields, which behave like tau(3), exp (tau) and tau(3), respectively. The first regime, corresponding to a quasi-linear description of the trajectories, is analogous to the one observed in fluid turbulence and is valid in the limit of a small amplitude turbulent spectrum, or for not too small initial separation of the particles. The third regime, appearing for long times, describes the diffusion of independent particles at very large separations. Its existence is ensured by the nonlinear renormalization of the propagators. The second, intermediate, regime appears in a stochastic treatment of the renormalization effect for particles with a very small spatial and velocity difference, and describes Dupree's clumps diffusion. The appearance of the corresponding regime is similar to that of the Suzuki scaling regime of non-linear Langevin equations. It is also shown that the clumps have a behavior similar to an intrinsic stochasticity, but which is of extrinsic nature. Similar failure of the quasi-linear approximation for specific velocity domains was previously studied and solved for classical Landau collisions, as well as for pitch angle diffusion where renormalization effects were proved also to be important. DOE

N82-23027# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. de Recherches sur la Fusion Controlee.
POLARISATION CIRCUITS OF THE DECELERATION GRID OF AN ION SOURCE
J. F. Bonnal, J. Druaux, and R. Oberson Feb. 1981 17 p In FRENCH
(EUR-CEA-FC-1081) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The development of duopigatrons for TFR 400 and 600 and of periplasmatrons for ASDEX necessitated the design of reliable high tension electrical circuits. The working conditions are investigated thoroughly during transient periods. The polarization circuits of the deceleration grid which were used successfully during these experiments are described. DOE

N82-23028# Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service.
A NONLINEAR KINETIC THEORY FOR ELECTRON HEATING OF PLASMA GENERATED WITH A HIGH FREQUENCY ELECTROMAGNETIC FIELD
L. Pollachini 1981 9 p refs Presented at 15th Intern. Conf. on Phenomena in Ionized Gases, Minsk, USSR, 14-18 Jul. 1981
(CISE-1703) Avail: NTIS HC A02/MF A01

The interaction between a plasma and a high frequency alternating electromagnetic field is analyzed relative to controlled nuclear fusion. An infinite cylindrical column of ionized gas is considered. An alternating electric field is applied on its wall, parallel to the cylinder axis, symmetrical, and with a frequency omega/2pi. The collisions determine the energy transfer from the electric field to the electrons of the gas, causing ionization and recombination phenomena, generating a radially nonhomogeneous plasma. A nonlinear kinetic theory is presented which describes the generation of the nonhomogeneous plasma column and its electron heating in an HF discharge. The theory deals not only with conventional ionization and recombination collision effects, but also with energy transfer connected with the electronic temperature variation in the various points of the column and with the temperature difference among electrons, positive ions, and neutral atoms in the plasma. Author (ESA)

N82-23125*# Central Missouri State Univ., Warrensburg.
ANALYSIS OF I-V CHARACTERISTICS OF NEGATIVELY BIASED PANELS IN A MAGNETO-PLASMA Final Report
Donald D. Miller *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 39 p refs (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 20I

N82-23136*# Ripon Coll., Wis.
COMPUTER SIMULATION OF CURRENT COLLECTION IN A PLASMA ENVIRONMENT Final Report
Dino Zei *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 15 p (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 20I

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

N82-23029 Kentucky Univ., Lexington.
SOLITONS AND COMMENSURATE-INCOMMENSURATE TRANSITION IN QUASI-ONE-DIMENSIONAL CONDUCTORS Ph.D. Thesis
Marek Grabowski 1981 159 p
Avail: Univ. Microfilms Order No. 8129743

Quasi-one-dimensional conductors and solitons in general are introduced and a microscopic derivation of the effective phase-amplitude Hamiltonian that describes the nonlinear phase-amplitude excitations in a Peierls-Frohlich conddensate is detailed. Both electron-phonon and electron-electron interactions are considered. Several novel features of soliton physics emerge from the exact soliton solutions of such a model Hamiltonian: the existence of static multi-soliton bound states (solitonic 'molecules') in the commensurate system and solitonic 'molecular' lattice in the incommensurate system. The effect of phase-amplitude coupling on the lock-in transition is further investigated with reference to two models concerned with two-fold commensurability in the context of charge density waves. At the microscopic level of the theory, the electronic spectrum of a linear chain polyene containing soliton-like defects is investigated. Both Peierls-like bond alternation and on-site Coulomb repulsion (of strength U) are then included in an unrestricted Hartree-Fock scheme. Dissert. Abstr.

N82-23030*# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
HIGH PURITY LOW DISLOCATION GaAs SINGLE CRYSTALS Final Report, 25 Feb. 1980 - 24 Feb. 1981
R. T. Chen, D. E. Holmes, and C. G. Kirkpatrick Jan. 1982 46 p
(Contract NAS3-22224)
(NASA-CR-165593; NAS 1.26:165593; ERC41054.36FR) Avail: NTIS HC A03/MF A01 CSCL 20B

Recent advances in GaAs bulk crystal growth using the LEC (liquid encapsulated Czochralski) technique are described. The dependence of the background impurity concentration and the dislocation density distribution on the materials synthesis and growth conditions were investigated. Background impurity concentrations as low as 4 x 10 to the 15th power were observed in undoped LEC GaAs. The dislocation density in selected regions of individual ingots was very low, below the 3000 cm .3000/sq cm threshold. The average dislocation density over a large annular ring on the wafers fell below the 10000/sq cm level for 3 inch diameter ingots. The diameter control during the program advanced to a diameter variation along a 3 inch ingot less than 2 mm. Author

N82-23031*# National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD AND APPARATUS FOR GROWTH OF CRYSTALS BY PRESSURE REDUCTION OF SUPERCRITICAL OR SUBCRITICAL SOLUTION Patent Application
Paul J. Shlichta, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 26 Jan. 1982 28 p
(Contract NAS7-100)
(NASA-Case-NPO-15772-1; US-Patent-Appl-SN-342944) Avail: NTIS HC A03/MF A01 CSCL 20L

Crystals of high morphological quality are grown by dissolution of a substance to be grown into the crystal in a suitable solvent under high pressure, and by subsequent slow, time controlled reduction of the pressure of the resulting solution. During the reduction of the pressure interchange of heat between the solution and the environment is minimized by performing the pressure reduction under isothermal or adiabatic conditions. NASA

N82-23032*# Pittsburg Univ., Pa. Dept. of Chemistry.
THEORETICAL STUDIES OF THE ELECTRONIC STRUCTURE OF SMALL METAL CLUSTERS Final Report, 1 Oct. 1979 - 31 Mar. 1981
Kenneth D. Jordan 31 Mar. 1982 7 p refs
(Grant NsG-2407)
(NASA-CR-168391; NAS 1.26:168391) Avail: NTIS HC A02/MF A01 CSCL 20L

Theoretical studies of the electronic structure of metal clusters, in particular clusters of Group IIA and IIB atoms were conducted. Early in the project it became clear that electron correlation involving d orbitals plays a more important role in the binding of these clusters than had been previously anticipated. This necessitated that computer codes for calculating two electron integrals and for constructing the resulting CI Hamiltonions be replaced with newer, more efficient procedures. Program modification, interfacing and testing were performed. Results of both plans are reported. J.M.S.

N82-23033*# Stanford Univ., Calif. Dept. of Materials Science and Engineering.
DIRECT OBSERVATION OF INTERFACE INSTABILITY DURING CRYSTAL GROWTH Final Technical Report
W. A. Tiller, R. S. Feigelson, and Dennis Elwell Mar. 1982 62 p refs

(Contract NAS8-33110)
(NASA-CR-161999; CMR-82-19; NAS 1.26:161999; SU-CMR-82-19) Avail: NTIS HC A04/MF A01 CSCL 20L

The general aim of this investigation was to study interface stability and solute segregation phenomena during crystallization of a model system. Emphasis was to be placed on direct observational studies partly because this offered the possibility at a later stage of performing related experiments under substantially convection-free conditions in the space shuttle. The major achievements described in this report are: (1) the development of a new model system for fundamental studies of crystal growth from the melt and the measurement of a range of material parameters necessary for comparison of experiment with theory. (2) The introduction of a new method of measuring segregation coefficient using absorption of a laser beam by the liquid phase. (3) The comparison of segregation in crystals grown by gradient freezing and by pulling from the melt. (4) The introduction into the theory of solute segregation of an interface field term and comparison with experiment. (5) The introduction of the interface field term into the theories of constitutional supercooling and morphological stability and assessment of its importance. L.F.M.

N82-23034# Stockholm Univ. (Sweden). Inst. of Physics.
THE SPECTRUM OF CuO: WAVE NUMBERS, TERM VALUES, AND CONSTANTS
O. Appelblad and L. Klynning Feb. 1981 64 p refs
(USIP-81-02) Avail: NTIS HC A04/MF A01

The 60 bands in the emission spectrum of the CuO molecule which were rotationally analyzed and ordered into systems are studied. The wave numbers of all the analyzed rotational lines are tabulated and term values of the 13 investigated excited states are found. Molecular constants are also recalculated for the excited states and the ground state of the CuO molecule. The ground state is involved in all the observed transitions. Since the lower term values show no irregularities, the ground state can be represented by a simple energy expression. Under these circumstances, it is advantageous to calculate all the term values of the excited states simultaneously with the molecular constants of the ground states. Author (ESA)

N82-23035# Stockholm Univ. (Sweden). Inst. of Physics.
GAIN: AN INTERACTIVE COMPUTER PROGRAM FOR DATA ANALYSIS IN DEPTH SELECTIVE CONVERSION ELECTRON MOESSBAUER SPECTROSCOPY
D. Liljequist and C. Bohm Apr. 1981 46 p refs
(USIP-81-06) Avail: NTIS HC A03/MF A01

The program is used for the interpretation of depth selective CEM spectra in terms of the spatial distribution of phases in the surface region of Fe 57 Mossbauer absorbers. The program is written in FORTRAN and can be run on a VAX 11 minicomputer. It can be used with a graphic or nongraphic terminal. It has four options: linear combination display (graphic); phase signal analysis (nongraphic); simulation of phase signals (nongraphic); and simulation of Mossbauer spectra (graphic). Examples are given. Author (ESA)

N82-23036# Stockholm Univ. (Sweden). Inst. of Physics.
THE THEORETICAL PREDICTION OF BULK AND SURFACE PHASE SIGNALS AS FUNCTIONS OF SURFACE LAYER THICKNESS IN CONVERSION ELECTRON MOESSBAUER SPECTROSCOPY USING NONENRICHED Fe 57 ABORBERS
D. Liljequist Oct. 1981 54 p refs
(USIP-80-07) Avail: NTIS HC A04/MF A01

Theory for computing the integral Fe 57 CEMS phase signal is developed within approximations valid for natural Fe 57 abundance. Monte Carlo simulated electron transport data are reported. Resonant photoelectron production and resonant reabsorption in the surface region with subsequent electron emission are calculated with improved accuracy. The effect of detector efficiency is considered and electron energy dependent efficiency is accounted for. A computer program for the analysis of absorbers, containing two phases (surface and bulk), in terms of surface layer thickness is presented. Author (ESA)

N82-23037# Stockholm Univ. (Sweden). Inst. of Physics.
CONFIGURATION-MIXED ALPHA-DECAY RATE CALCULATION FOR THE DECAYS OF THE 1- AND 9- STATES IN At212
P. Carle and T. Erikson (Royal Inst. of Technology, Stockholm) Nov. 1981 30 p refs
(USIP-81-10) Avail: NTIS HC A03/MF A01

The relative alpha decay rate for the decays of the 1- and 9states in At212 to states in Bi208 was calculated. As unperturbed states of At212, the product states of the three-proton nucleus At211 and the one-neutron nucleus Pb209 are taken, the energies and wave functions for the states of these nuclei being obtained from other analyses. The mixture is determined by diagonalizing the Kuo-Herling interaction. An improved agreement with experiment is achieved using this mixture in the alpha decay calculation. In particular, this is true for the decay to states with pion (h9/2) neutrino (f5/2)-1 as main component, whereas the result for the decays to states with main component pion (h9/2) neutrino (p1/2)-1 is less satisfactory. Author (ESA)

N82-23038 Kansas Univ., Lawrence.
THERMALLY-INDUCED CHANGES IN THE DEFECT SUBSTRUCTURE OF PURE AND DOPED MAGNESIUM OXIDE Ph.D. Thesis
Robert Maxwell Bunch 1981 124 p
Avail: Univ. Microfilms Order No. 8128761

Three independent nondestructive elastic light scattering and imaging techniques; ultramicroscopy, bulk scattering angular distributions, and large angle bulk scattering as a function of crystal orientation were used to self consistently examine the precipitated defect substructure of MgO. Computational routines were developed to fit the bulk scattering angular distribution measurements and determine the particle size distributions, as well as the total particle population, using Mie theory or other approximation schemes. The aggregation, precipitation, growth, and development of structures beyond the point defect stages up to macroscopic dimensions were followed through a number of controlled heat treatments. The progressive changes seen in the size of particulates within the bulk of the samples showed effects similar to coarsening of Oswald ripening. The theoretical size distributions for each ripening case were used to predict the time evolution of the angular dependence of scattered light from precipitates in an ionic crystal at a particular annealing temperature. Magnesium oxide crystals doped with nickel and cobalt were used as samples to test the theoretical ripening model. Dissert. Abstr.

N82-23039 North Dakota Univ., Grand Forks.
STUDY OF THE OPTICAL CONSTANTS OF BISMUTH TELLURIUM SULFIDE Ph.D. Thesis
Vinod Kumar Nangia 1981 108 p
Avail: Univ. Microfilms Order No. 8126575

Experimental measurements of the optical reflectance of bismuth tellurium sulfide Bi2(Te(1-x)S(x)3; x = 0.48 were carried out both at normal and oblique incidence angles over a range of wavelengths. Bismuth tellurium sulfide is a uniaxial crystal that grows as a layered structure in sets of five atomic layers called quintuple layers. These layers are perpendicular to the optic axis of the crystal. Due to weak Van der Waals bonds between the adjacent quintuple layers, the crystal cleaves easily along these layers and presents atomically smooth surfaces for reflectance studies. The measured reflectance spectra were analyzed by two different methods to determine the optical constants n and k. Two sets of optical constants (n(a),k(a)) and n(c),k(c)) are associated with a uniaxial crystal depending upon the polarization of the incident electromagnetic wave. Dissert. Abstr.

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

N82-23040# European Space Agency, Paris (France).
THE ELEMENTARY QUANTUM: SOME CONSEQUENCES

IN PHYSICS AND ASTROPHYSICS OF A MINIMAL ENERGY QUANTUM

H. Broberg, ed. and W. R. Burke Dec. 1981 71 p refs
(ESA-STM-223; ISSN-0379-4075) Avail: NTIS HC A04/MF A01

A theory which relates gravitational and inertial forces, and mass and energy, to a single concept, the elementary quantum is proposed. The quantum is described mathematically by an isotropic two dimensional oscillator, assuming that quantum momentum is perpendicular to the plan of oscillation. Photons would react with such quanta in space and thereby lose energy, thus leading to the red shift of starlight. The background 2.7 K radiation in space would consist of the decaying radiation of all wavelengths in which the elementary quantum is the final state. All microparticles would consist of confined energy quanta in resonance states, and absorb energy in the form of elementary quanta from space until they went out of resonance and decayed. The gravitational effect is related to this mass absorption process, the natural flow of elementary quanta from space to particles are the initiator of the interacting gravitational forces.

Author (ESA)

N82-23041# Stockholm Univ. (Sweden). Inst. of Physics.
INTRODUCTORY LECTURES ON SUPERSYMMETRY, SUPERSPACE AND SUPERGRAVITY

Ulf Lindstroem Jan. 1981 59 p refs
(USIP-81-01) Avail: NTIS HC A04/MF A01

A maximal theory as a unified field theory, where bose-fermi symmetry is reconciled with gravity, is presented. The idea of local gage invariance is the key concept in the view of interactions. In order to obtain a theory that is completely unified, treating all interactions in the same geometrical way with all fields as gage fields, supersymmetry, a symmetry turning bosons into fermions and vice versa, is introduced. Supergravity is founded on such a symmetry and has the Planck energy (10 to the 19th power GeV) as unification scale. A computational tool for treating supersymmetry multiplets and forming Lagrangians is shown, relating to superspace. Curved superspace is then defined and its structure is described. Author (ESA)

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N82-23042# General Accounting Office, Washington, D. C.
MISSION ITEM ESSENTIALITY: AN IMPORTANT MANAGEMENT TOOL FOR MAKING MORE INFORMED LOGISTICS DECISIONS Report to the Secretary of Defense

13 Jan. 1982 43 p refs
(PLRD-82-25; B-205399) Avail: SOD

Mission item essentiality, the means by which the essentiality of individual items is linked to mission essentiality of the end-item is discussed. It offers vast potential as a management tool for the services in making logistics decisions concerning requirements determination, resource allocation, and repair priorities. The Department of Defense developed a concept guide for use by the services. However, the department has allowed the services to proceed at their own pace and approach the matter from different viewpoints. As a result, progress has been slow. It was concluded tha the department should require the services to follow the concept guide and establish milestones for accomplishing the specific tasks set forth in the guide. The Air Force is ahead of the other services in developing a conceptually sound essentiality coding system, but has run into problems in implementing the system. Once the implementation problems have been resolved, it is argued that the system will greatly benefit the Air Force in its logistics decision making process.

R.J.F.

N82-23043# Comptroller General of the United States, Washington, D.C.
STREAMLINING AND ENSURING MINERAL DEVELOPMENT MUST BEGIN AT LOCAL LAND MANAGEMENT LEVELS Report to the Chairman, Committee on Energy and Commerce, House of Representatives

4 Dec. 1981 24 p refs
(EMD-82-10; B-205344) Avail: SOD

A study of the use of Federal lands, particularly military lands, concluded that success in streamling and accelerating mineral development on Federal lands depends on the Bureau of Land Management state offices ultimately responsible for the implementation of Department of Interior minerals policies. It was found the eastern States Office of the Bureau of Land Management did not effectively deal with potential Federal mineral trespass in the East, and was unable to issue mineral leases and permits on a timely basis. Moreover, it was unable to effectively deal with new areas of mineral interest because of Department actions. Recommendations to improve the mineral trespass program help relieve lease and permit backlogs, maintain dedicated staff, and improve headquarters communications with State offices were made. R.J.F.

N82-23044*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INTRODUCTION TO SIMRAND: SIMULATION OF RESEARCH AND DEVELOPMENT PROJECT

Ralph F. Miles, Jr. 1 Mar. 1982 14 p
(Contracts NAS7-100; DE-AI01-76ET-20356)
(NASA-CR-168811; JPL-Pub-82-20; DOE/JPL-1012-68; JPL-5105-204; NAS 1.26:168811) Avail: NTIS HC A02/MF A01 CSCL 05A

SIMRAND: SIMulation of Research ANd Development Projects is a methodology developed to aid the engineering and management decision process in the selection of the optimal set of systems or tasks to be funded on a research and development project. A project may have a set of systems or tasks under consideration for which the total cost exceeds the allocated budget. Other factors such as personnel and facilities may also enter as constraints. Thus the project's management must select, from among the complete set of systems or tasks under consideration, a partial set that satisfies all project constraints. The SIMRAND methodology uses analytical techniques and probability theory, decision analysis of management science, and computer simulation, in the selection of this optimal partial set. The SIMRAND methodology is truly a management tool. It initially specifies the information that must be generated by the engineers, thus providing information for the management direction of the engineers, and it ranks the alternatives according to the preferences of the decision makers. Author

N82-23045# Deutsche Gesellschaft fuer Luft- und Raumfahrt, Cologne (West Germany).
ERNST HEINKEL: MILESTONES IN HIS LIFE [ERNST HEINKEL: MEILENSTEINE AN SEINEM LEBENSWEG]

H. Dieter Koehler 1981 80 p In GERMAN; ENGLISH summary
(DLR-Mitt-81-01) Avail: NTIS HC A05/MF A01; DGLR, Cologne DM 18.50

A short biography of Ernst Heinkel is presented. A chronological account of his achievements as an aircraft designer and an industrialist is presented. Notable achievements and inventions of Heinkel's assistants are also described. Author (ESA)

N82-23046# European Space Research and Technology Center, Noordwijk (Netherlands). Power and Control Systems Div.
EUROPEAN SPACE TRIBOLOGY LABORATORY MANAGEMENT PROCEDURES HANDBOOK

Nov. 1981 29 p
(ESA-PSS-06-3; ISSN-0379-4059) Avail: NTIS

HC A03/MF A01

Management structures by which the laboratory is operated are presented. The constitution and responsibilities of the management bodies are defined. The responsibilities of key individuals are listed. Procedures used in implementing the management policies decided on by ESA are outlined. These procedures are mandatory, and alterations, additions or amendments to them are made only with the agreement of the Technical Director. Quality control, costing and scheduling are included.

Author (ESA)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N82-23047 Hatfield Polytechnic (England). National Reprographic Centre for Documentation.

REVIEW OF DEVELOPMENTS IN COLOUR MICROGRAPHICS: 1968 TO 1977 Technical Report, 1968 - 1977

Alan Horder May 1978 126 p refs

(NRCd-11) Avail: Issuing Activity

The use of color microforms is assessed from the literature and from user and manufacturer reports. Production, application, duplication, printout, image quality, permanence and standardization are discussed. Computer output microfilms is discussed. Printout, like of maps, is limited by lack of equipment. Growth in microfiche utilization for training is predicted, but in education the need to order at least 50 duplicates from any master from commercial laboratories limits expansion. Author (ESA)

N82-23048 Hatfield Polytechnic (England). National Reprographic Centre for Documentation.

FULL TEXT INFORMATION SYSTEMS: A REVIEW AND ASSESSMENT OF THE TECHNOLOGY

John W. T. Smith 1980 181 p refs

(NRCd-13) Copyright. Avail: Issuing Activity

Stand alone full text information systems, each unit serving a limited number of users, are evaluated for their access times, storage capacity, and ability to be connected with other systems and information processing equipment. Technologies that could link them in a global information system are considered. Satellite use increases, but the combination with fiber optics only produces a 100 fold increase in communications capacity, and a 10 fold drop in costs. On line text remains much more expensive than off line. The importance of full text informatin in a high growth scenario is realized. Government interest helps produce a 1000 fold growth with corresponding cost reductions. It is concluded that it is cheaper to store and transmit text visually than it is to distribute it via traditional channels.

Author (ESA)

N82-23049# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

WHAT SHOULD USERS EXPECT FROM INFORMATION STORAGE AND RETRIEVAL SYSTEMS OF THE 1980'S?

Dec. 1981 117 p refs Proceedings of Conf. held in Munich, 9-10 Sep. 1981

(AGARD-CP-304; ISBN-32-835-0305-8) Avail: NTIS HC A06/MF A01

Developments in the aerospace and defense information field and the information science field in general, are discussed. Unresolved problems, user and supplier related, in automatic indexing, fact retrieval, and input standardization are reviewed. The impact of technical and sociological changes on information services, now and in the future, is also addressed. For individual titles, see N82-23050 through N82-23060.

N82-23050# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).

CHANGING INFORMATION SCENE: FROM THE TIP SPECIALISTS' MEETING 1968 IN MUNICH TO THE EIGHTIES

R. K. H. Bree *In* AGARD What Should Users Expect from Inform. Storage and Retrieval Systems of the 1980's Dec. 1981 5 p (For primary document see N82-23049 13-82)

Avail: NTIS HC A06/MF A01

The changing information scene, specifically storage and retrieval methods, is evaluated. On-line dialogue and interconnecting data bases are considered in terms of user needs. Constraints on the user by the various communication processes and responsibilities on the suppliers side are also considered. The need for and importance of information brokers in handling user demands is discussed. Broader standardization of rules and regulations for the use of offered services are recommended.

M.D.K.

N82-23051# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).

MAJOR DEVELOPMENTS IN MODERN INFORMATION SERVICES: THE CANADIAN EXPERIENCE **c82**

George Ember *In* AGARD What Should Users Expect from Inform. Storage and Retrieval Systems of the 1980's Dec. 1981 4 p (For primary document see N82-23049 13-81)

Avail: NTIS HC A06/MF A01

Major developments in modern information services were studied with primary focus on the user related operational nature of services. Computer design and automation, improvements in telecommunication, and the union of computer and telecommunication technologies were evaluated. The importance of data banks in providing access to critically evaluated numeric data and research results and in bringing people together to solve problems is also discussed. The role of on-line document ordering and delivery was also considered in the study. M.D.K.

N82-23052# Siemens A.G., Munich (West Germany). DV System DB/DC.

MAJOR DEVELOPMENTS IN HARDWARE, SOFTWARE AND TELECOMMUNICATIONS IN THE FIELDS OF INFORMATION STORAGE AND RETRIEVAL

D. Morgenstern *In* AGARD What Should Users Expect from Inform. Storage and Retrieval Systems of the 1980's Dec. 1981 5 p refs (For primary document see N82-23049 13-82)

Avail: NTIS HC A06/MF A01

Recent progress in information storage and retrieval systems and related advances in the information industry are discussed. Developments in hardware architecture and software and in telecommunications and data networks are emphasized. Two main trends in the future development of data base technology are cited, the implementation of extremely large data base systems and data base decentralization. M.D.K.

N82-23053# Centre de Documentation de l'Armement, Paris (France). Office of Scientific and Technical Information.

NONTECHNICAL FACTORS INFLUENCING INFORMATION SYSTEMS

M. Albert Yanez *In* AGARD What Should Users Expect from Inform. Storage and Retrieval Systems of the 1980's Dec. 1981 21 p refs (For primary document see N82-23049 13-82)

Avail: NTIS HC A06/MF A01

Some effects of nontechnical and organizational factors on information systems are presented. The organizational, political, economic, legal and human factors involved are discussed in terms of vendor or host computer functions and user requirements, specifically requirements of scientists and engineers. M.D.K.

N82-23054# Centre de Documentation de l'Armement, Paris (France). Sektion fuer Technik.

AUTOMATED INDEXING AND THE FREE TEXT METHOD

Werner Meder *In* AGARD What Should Users Expect from Inform. Storage and Retrieval Systems in the 1980's Dec. 1981 4 p refs (For primary document see N82-23049 13-82)

Avail: NTIS HC A06/MF A01

The method of automated indexing for document content analysis as a method to supplement or supersede the knowledge and experience of a human analyst is presented. Problems of automated indexing, free text retrieval, comparison of both, and suggestions for further development and a synthesis of both methods are discussed. M.D.K.

N82-23055# California Univ., Livermore. Lawrence Livermore Lab. Technology Information System Dept.

FACT RETRIEVAL IN THE 1980'S

Viktor E. Hampel *In* AGARD What Should Users Expect from Inform. Storage and Retrieval Systems of the 1980's Dec. 1981 36 p refs (For primary document see N82-23049 13-82)
(Contract W-7405-eng-48)
Avail: NTIS HC A06/MF A01

Prevailing methodologies of fact retrieval in science and technology are reviewed. Numeric databases are shown to overtake in size and number the large bibliographic collections. The availability of low-cost intelligent computer terminals, micro- and minicomputers, is shown to make aggregation and post-processing of retrieval information from different sources readily possible. The user community is seen to shift from expert information specialists to the end-users of information. Techniques of tabular and graphical fact retrieval are examined. The prospects of fact retrieval by voice, touch screens, and videotext are discussed. The potential of two unusual three-dimensional display techniques, the computer-generated time-resolved integral hologram and the projection of virtual data images into space, are discussed. Author

N82-23056# Trondheim Univ. (Norway). Dept. of Documentation.

USER REQUIREMENTS IN HANDLING ONLINE SYSTEMS AND NETWORKS

Aud Lamvik *In* AGARD What Should Users Expect from Inform. Storage and Retrieval Systems of the 1980's Dec. 1981 5 p refs (For primary document see N82-23049 13-82)
Avail: NTIS HC A06/MF A01

Online systems and networks used by Norwegian searchers are outlined. The Nordic information network SCANNET is described. User problems and needs are presented in the light of the work in online user groups. Author

N82-23057# National Library of Medicine, Bethesda, Md. National Center for Biomedical Communications.

OPTICAL DISC TECHNOLOGY AND ITS IMPLICATIONS FOR INFORMATION STORAGE AND RETRIEVAL IN THE EIGHTIES

Charles M. Goldstein *In* AGARD What Should Users Expect from Inform. Storage and Retrieval Systems of the 1980's Dec. 1981 8 p refs (For primary document see N82-23049 13-82)
Avail: NTIS HC A06/MF A01

Optical disc technology includes the storage and retrieval of random access graphics on videodiscs as well as the storage of digital information. Optical digital discs for computer mass storage are currently under development by many firms. In addition, efforts are underway to allow the encoding of digital information on videodiscs. The latter is desireable as an inexpensive publication medium for machine readable data as well as a means of obtaining both video and digital information on one disc. Potential applications of this technology include inexpensive online storage, random access graphics to complement online information systems, hybrid network architectures, office automation systems, and archival storage. Author

N82-23058# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

USERS REQUIREMENTS FOR TERMINALS: SELECTION, USE AND ECONOMIC FACTS

H. J. Leebeek *In* AGARD What Should Users Expect from Inform. Storage and Retrieval Systems of the 1980's Dec. 1981 6 p (For primary document see N82-23049 13-82)
Avail: NTIS HC A06/MF A01

In many process-control situations a computer is used to assist the man operating the system. The various tasks can be allocated between man and machine; the machine, or the computer, to undertake the dull, repetitious or fatiguing tasks; the human operator to undertake the supervisory and decision-making tasks. The elements of the tasks thus designed and assigned to the human operator are the perception of the machine output signals and the initiation of a desired state through control actions. Author

N82-23059# Ashford (J. H.) Associates Ltd., Maidenhead (England).

THE USE OF SMALL COMPUTERS IN INFORMATION RETRIEVAL FROM TEXTURAL AND FREE-STRUCTURED DATA-BASES

J. H. Ashford *In* AGARD What Should Users Expect from Inform. Storage and Retrieval Systems of the 1980's Dec. 1981 6 p refs (For primary document see N82-23049 13-82)
Avail: NTIS HC A06/MF A01

Minicomputer systems are well established for the storage and retrieval of bibliographic records and the full text of documents. Examples are given of a range of applications including the handling of numeric and experimental data. The relationship between free text and structured records is examined, and the appearance of hybrid data forms is noted. Author

N82-23060# Commission of the European Communities, Luxembourg.

ONE YEAR OF EURONET DIANE EXPERIENCE AND EXPECTATIONS

Barry Mahon *In* AGARD What Should Users Expect from Inform. Storage and Retrieval Systems of the 1980's Dec. 1981 3 p (For primary document see N82-23049 13-82)
Avail: NTIS HC A06/MF A01

The telecommunications network in particular the relationship between the European Commission and the consortium of eleven PTT's who provide the technical facilities are described. The evolution of Euronet into a public packet switched network for all the European Community Member States and also for countries outside the Communities, is also described. Concerning the information services, collectively referred to as DIANE, the expansion that has taken place in files available since commercial opening is described and the progressive shift in emphasis from purely bibliographic services to a mix of factual data banks and bibliographic data bases is analyzed. The ancillary facilities, referral, document ordering and delivery, etc., either operational or under development are also described in particular the activities of the European Communities in developing the common command language and the program of work designed to overcome the language barrier. Experience of the Commission and the Member States in the development of new information services, the integration of new forms of interactive information services (Viewdata) and the contribution that Euronet DIANE had made towards the evolving 'telematique' society, are discussed. Author

N82-23061# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Technical Information Panel.

MANUAL OF DOCUMENTATION PRACTICES APPLICABLE TO DEFENCE AEROSPACE SCIENTIFIC AND TECHNICAL INFORMATION. VOLUME 5: INDEX

Tom Norton (Royal Aircraft Establishment, Farnborough, England)) Feb. 1982 83 p
(AGARD-AG-235-Vol-5; ISBN-92-835-1414-9) Avail: NTIS HC A05/MF A01

A manual was written describing the basic documentation practices involved in the initial setting up and operation of an information-library organization to provide defense aerospace information services. The index to that manual is presented. S.L.

N82-23062# Centre for Scientific and Technical Information, Pretoria (South Africa).

AN INVESTIGATION INTO THE POSSIBILITY OF USING ONLINE DOCUMENT DELIVERY SYSTEMS

D. P. Steyn Feb. 1981 17 p refs
(CSTI-32) Avail: NTIS HC A02/MF A01

A problem common to most bibliographic literature searches, that of obtaining copies of the original documents cited in the literature, is reviewed. Various overseas online document delivery services now available are discussed. These can be used in conjunction with online bibliographic database systems. The possibility of using these online document delivery systems from South Africa was investigated. It was found that it is feasible to use these new services locally at a cost of about R10,00 per document. Efficiency, courtesy and an all out effort to please clients characterized the services. High costs prevent the services being used on a wide scale at present. However, they can serve as a good back-up service for local Inter Library Loan (ILL) services. Any future wide scale use of such services may make South African users again dependent on overseas sources.

This trend could be provided by improving the local ILL services. Author

N82-23063# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
INFORMATION TECHNIQUES 1981: FUNDAMENTAL TECHNIQUES. SIGNIFICANT TECHNICAL DEVELOPMENTS IN TECHNICAL INFORMATION AT FOA [INFORMATIONSTEKNIK 1981: GRUNDTEKNIK. TEKNISK UTVECKLING AV BETYDELSE FUER FOA VERKSAMHET INOM DET INFORMATIONSTEKNISKA OMRAADET]
Bengt Kleman and Soeren Palmgren Jul. 1981 82 p In SWEDISH
(FOA-A-30029-E1) Avail: NTIS HC A05/MF A01

A broad overview of technical developments in the following fields is presented: (1) microwave and millimeterwave techniques; (2) optics; (3) microelectronics and microcomputers; and (4) data techniques. Present and future trends are described based on research and technical-economic projects in various parts of the world. A basis for prognosis of future military technological development is given. J.M.S.

N82-23064# National Center for Education Statistics, Washington, D.C.
LIBRARY STATISTICS OF COLLEGES AND UNIVERSITIES: TRENDS 1968-1977, SUMMARY DATA 1977
Richard M. Beazley 1981 60 p ref
(PB82-127275; NCES-81-200) Avail: NTIS HC A04/MF A01 CSCL 05B

Trends in data on collections, operating expenditures, staff, circulation, and interlibrary loans in college and university libraries are examined over the decade from 1968 to 1977. Increases in library resources are compared with increases in the student population and with several measures of inflation to assess the real growth in academic libraries over the decade. GRA

N82-23065# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
COPYRIGHT: 1971 - 1981
Ronald J. Millen Jan. 1982 32 p refs
(AGARD-AR-176; ISBN-92-835-1411-4) Avail: NTIS HC A03/MF A01

Developments since 1970 are described. Concentrating on the situation in the United States of America and the United Kingdom, but including comments on the position in the NATO member nations and several other countries. The emphasis is on photocopying in libraries and of other matters which directly affect information transfer, such as software and database protection. Some of the current international developments are mentioned, including the effects of the EEC and the accession of the Soviet Union to the Universal Copyright Convention. Author

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N82-23066# Committee on Appropriations (U. S. Senate).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT, AND CERTAIN INDEPENDENT AGENCIES APPROPRIATIONS FOR FISCAL YEAR 1982, PART 2
Washington GPO 1982 1255 p Hearings on H.R. 4034 before the Comm. on Appropriations, 97th Congr., 1st Sess.
(GPO-90-819-Pt-2) Avail: SOD HC

Budget hearings before a U.S. Senate appropriations subcommittee for FY ending Sept. 30, 1982 are presented. Agencies affected include HUD, NASA, and NSF. For individual title, see N82-23067.

N82-23067# Committee on Appropriations (U. S. Senate).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT AND INDEPENDENT AGENCIES APPROPRIATIONS FOR FISCAL YEAR 1982. NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Hearing on H.R. 4034 before the Comm. on Appropriations, 97th Congr., 1st Sess., 12 May 1981 Washington GPO (For primary document see N82-23066 13-84)
Avail: SOD HC

Budget-related testimony by NASA officials is presented. Related documentation is included. The space shuttle is evaluated. Commercial opportunities are discussed. Research programs are discussed. Management procedures are reviewed. Personnel management is addressed. Funding for the numerous agency programs is reviewed. N.W.

N82-23068# Committee on Science and Technology (U. S. House).
THE 1983 NASA AUTHORIZATION, VOLUME 1
Washington GPO 1982 114 p Hearing before the Subcomm. on Transportation, Aviation and Mater. of the Comm. on Sci. and Technol., 97th Congr., 2nd Sess., No. 71, 17 Feb. 1982
(GPO-91-488-Vol-1) Avail: Subcommittee on Transportation, Aviation and Materials

The status of NASA systems technology programs which provide focused technology applications principally to civil aviation is addressed in light of the cost effectiveness of NASA's partnership with the aircraft industry and the economic impact of the reduction of NASA's roll in promoting advanced aeronautical technology. Progress made in research and technology programs encompassing aerodynamics, propulsion, materials and structures as well as controls and guidance, human factors, and low speed and high speed aircraft technology is reported. The six elements of the Aircraft Energy Efficiency program are highlighted. These are: engine component improvement, energy efficient engine, advanced turboprop, energy efficient transport, composite primary aircraft structures, and laminar flow control. The budget request for these programs is presented. N.W.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

N82-23069# General Accounting Office, Washington, D. C.
TRANSPORTATION: EVOLVING ISSUES FOR ANALYSIS
6 Jan. 1982 67 p
(CED-82-15) Avail: SOD

Numerous transportation issues and problems are discussed in an effort to improve the conceptual framework within which future planning activities will be undertaken. Control of mass transit costs, improvement of Conrail's management, financing of highways, and deregulation of airlines are some issues that are discussed. The major factors affecting the economic viability and efficiency of the U.S. transportation system are assessed. R.J.F.

N82-23070*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE DOE ETV-1 ELECTRIC TEST VEHICLE. PHASE 3: PERFORMANCE TESTING AND SYSTEM EVALUATION Final Report
Don Kurtz Dec. 1981 79 p refs
(Contracts NAS7-100; DE-AI01-78CS-54209)

(NASA-CR-168817; JPL-Pub-81-93; NAS 1.26:168817) Avail: NTIS HC A05/MF A01 CSCL 13F

Engineering tests were conducted in order to characterize overall system performance and component efficiencies within the system environment. A dynamometer was used in order to minimize the ambient effects and large uncertainties present in track testing. Extensive test requirements were defined and procedures were carefully controlled in order to maintain a high degree of credibility. Limited track testing was performed in order to corroborate the dynamometer results. Test results include an energy flow analysis through the major subsystems and incorporate the aerodynamic and rolling losses under cyclic and various steady speed conditions. The major output from all relevant dynamometer and track tests is also included. Author

N82-23071# Charles River Associates, Inc., Boston, Mass.
DEMAND FOR ELECTRIC AUTOMOBILES Final Report
S. D. Beggs Oct. 1981 116 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 1145-1)
(DE82-900864; EPRI-EA-2072) Avail: NTIS HC A06/MF A01

The possibility of a mass market for private electric cars is considered, not commercial or industrial users, and it is assumed multicar households are the most likely purchasers. Logit models of multivehicle households' choices of their smallest cars are estimated on two bodies of data: a panel study conducted by Arthur D. Little (ADL) in the spring of 1978, specifically to test consumers' reactions to hypothetical configuration for electric vehicles; and a sample of multivehicle households gathered in Baltimore in the spring of 1977. The ADL panel data allows estimation of consumers' valuations of novel characteristics of electric vehicles, notably limited range coupled with lengthy refueling time. The actual market data from Baltimore serves largely as a check on the validity of estimates obtained from the ADL panel. A generalization of the usual multinomial logit model, called the ordered logit model, is derived from basic economic and statistical principles, and is applied to the ranked choices of the ADL panel; the ordered logit model is compared to the conjoint model employed earlier by ADL. DOE

N82-23072# Arbeitsgemeinschaft Deutscher Verkehrsflughaefen, Stuttgart (West Germany).
PRESENT AND FUTURE ENERGY CONSUMPTION FOR PASSENGER TRANSPORTATION IN GERMANY [ENERGIEVERBRAUCH IM PERSONENFERNVERKEHR DER BUNDESREPUBLIK DEUTSCHLAND IN GEGENWART UND ZUKUNFT]
Manfred Kuhne and Udo Wolffram 1981 142 p refs In GERMAN
(ISBN-3-87977-051-4) Avail: NTIS HC A07/MF A01

Passenger transportation in Germany was investigated in order to determine real energy consumption. For typical passengers, energy consumption for overland travel and charter flights was studied. The energy needed for air traffic was compared with that for transportation overland (railway, car, bus), taking into account transportation to the airport or railway station. Transportation makes up about 17% of German primary energy consumption, i.e., road traffic 14%, railway traffic 1.6%, and air traffic 1%. Specific energy consumption (overland travel) of intercity trains, airplanes and cars is in the proportion 1.0 to 3.7 to 4.0 (1980) and is expected to be 1 to 2.4 to 3.1 by the year 2000. For holiday trips, specific energy consumption for bus, train, car and airplane travel is in the proportion 1.0 to 1.4 to 3.6 to 3.4 (1980) and is expected to be 1 to 1.4 to 2.5 to 2.9 by 2000. Author (ESA)

N82-23146# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
SLIP CONTROLLED WHEEL SETS FOR HIGH SPEED BOGIES [SCHLUPFGEREGELTE RADSAETZE FUER HOCHGESCHWINDIGKEITSDREHGESTELLE]
Christian Guenther, Helmut Hassel, and Rolf Leo *In its* Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 5 p In GERMAN Presented at 7th Intern. Radsatz-Kongr., Vienna, 25-29 Oct. 1981 (For primary document see N82-23137 13-99)
(MBB-UD-325-81-OE) Avail: NTIS HC A09/MF A01

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N82-23073 New York Univ., N. Y.
CALCIUM ABSORPTION LINES AND SOLAR ACTIVITY: A SYSTEMATIC PROGRAM OF OBSERVATIONS Ph.D. Thesis
Rush Dew Holt 1981 108 p
Avail: Univ. Microfilms Order No. 8127915

An observatory was erected at New York University to carry out a long term program of solar spectral observations in support of an effort to compare the line shapes of the chromospheric calcium spectral lines of the Sun viewed as a star with the corresponding ones of other stars. The facility has a plane mirror, equatorial mount heliostat which directs spatially integrated sunlight into a 1.8 meter Ebert-Fastie spectrometer with a resolution of about 0.03 Angstroms. Calcium H and K spectral line profiles are measured photoelectrically, displayed in analog form, and stored digitally. Data are taken almost daily. The construction of the observatory, the observational procedure, and the treatment of the data collected are described. The general nature of solar and stellar activity are reviewed and theories of the formation of the H and K lines in the chromosphere are discussed. Parameters characterizing the line shape are defined. Changes in these parameters, especially that describing asymmetry, correlate with other measures of solar activity.
Dissert. Abstr.

N82-23074*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
COMBINED ULTRAVIOLET STUDIES OF ASTRONOMICAL SOURCES Semiannual Report, 1 Aug. 1981 - 31 Jan. 1982
A. K. Dupree, M. S. Giampapa, J. P. Huchra, R. W. Noyes, L. W. Hartmann, and J. C. Raymond Mar. 1982 10 p refs
(Grant NAG5-87)
(NASA-CR-168789; NAS 1.26:168789; SAR-3) Avail: NTIS HC A02/MF A01 CSCL 03A

Ultraviolet studies of astronomical sources are discussed. Some studies utilized IVE data. Non-radiative shock at the edge of the Cygnses Loop, stellar flares, local interestellar medium, hot galaxies, stellar mass ejection, contact binaries, double quasars, and stellar chromosphere and coronae are discussed. R.J.F.

N82-23075*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION FOR THE MACHINE-READABLE VERSION OF OAO 2 FILTER PHOTOMETRY OF 531 STARS OF DIVERSE TYPES
Wayne H. Warren, Jr. Jan. 1982 18 p refs
(NASA-TM-84169; NSSDC/WDC-A-R/S-82-02; NAS 1.15:84169) Avail: NTIS HC A02/MF A01 CSCL 03A

A magnetic tape version of the ultraviolet photometry of 531 stars observed with the Wisconsin Experiment Package aboard the Orbiting Astronomical Observatory (OAO 2) is described. The data were obtained with medium band interference filters and were reduced to a uniform magnitude system. They represent a subset of partially reduced data currently on file at the National Space Sciene Data Center. The document is intended to enable users of the tape file to read and process data without problems or guesswork. For technical details concerning the observations, instrumentation limitations, and interpretation of the data the reference publication should be consulted. This document was designed for distribution with any machine-readable version of the OAO 2 photometric data. M.D.K.

N82-23076*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION FOR THE MACHINE-READABLE VERSION OF THE LICK JUPITER-VOYAGER REFERENCE STAR CATALOGUE
Wayne H. Warren, Jr. Jan. 1982 11 p refs
(NASA-TM-84170; NSSDC/WDC-A-R/S-82-04; NAS 1.15:8417) Avail: NTIS HC A02/MF A01 CSCL 03A

A machine-readable version is described of the Lick Jupiter-Voyager Reference Star Catalogue (Klemola, Morabito Taraji 1978) prepared for purposes of determining up-to-date, reasonably accurate, equatorial coordinates for reference stars in a band of sky against which cameras of the Voyager spacecraft were aligned for observations of Jovian satellites during the flyby. A.R.H.

N82-23077*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION FOR THE MACHINE-READABLE VERSION OF THE LICK SATURN-VOYAGER REFERENCE STAR CATALOGUE
Wayne H. Warren, Jr. Jan. 1982 11 p refs
(NASA-TM-84171; NSSDC/WDC-A-R/S-82-05; NAS 1.15:84171) Avail: NTIS HC A02/MF A01 CSCL 03A

The machine-readable version of the catalog is described. The catalog was prepared in order to determine accurate equatorial coordinates for reference stars in a band of sky against which cameras of the Voyager spacecraft were aligned for observations in the region of Saturn during the flyby. Tape contents and characteristics are described and a sample listing presented. J.D.

N82-23078*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION FOR THE MACHINE-READABLE VERSION OF A CATALOGUE OF HOMOGENEOUS PHOTOMETRY OF BRIGHT STARS ON THE DDO SYSTEM
Wayne H. Warren, Jr. Feb. 1982 13 p refs
(NASA-TM-84174; NSSDC/WDC-A-R/S-82-08; NAS 1.15:84174) Avail: NTIS HC A02/MF A01 CSCL 03A

The magnetic tape version of the Catalog of Homogeneous Photometry of Bright Stars on the DDO System is described. The catalog represents a compilation of DDO photometry of 2196 bright G and K stars prepared from observations made at Kitt Peak National and Cerro Tololo Inter-American observatories. Stars representative of good velocities, spectral types, and freedom from companion contamination are presented. J.M.S.

N82-23079*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION FOR THE MACHINE-READABLE VERSION OF THE VILNIUS PHOTOMETRIC CATALOGUE, 1980
Wayne H. Warren, Jr. Feb. 1982 23 p refs
(NASA-TM-84175; NSSDC/WDC-A-R/S-82-09; NAS 1.15:84175) Avail: NTIS HC A02/MF A01 CSCL 03A

The machine-readable version of the Vilnius Photometric Catalog 1980 is described. It is intended to enable users to read and process the data without problems or guesswork, and should be supplied with any secondary copies of the catalog. Author

N82-23080*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION FOR THE MACHINE-READABLE VERSION OF THE FIRST SANTIAGO-PULKOVO FUNDAMENTAL STARS CATALOGUE (SPF1 CATALOGUE)
Wayne H. Warren, Jr. Mar. 1982 13 p refs
(NASA-TM-84176; NSSDC/WDC-A-R/S-82-10; NAS 1.15:84176) Avail: NTIS HC A02/MF A01 CSCL 03A

The machine-readable version of the first Santiago-Pulkovo Fundamental Stars catalog is described. It is intended to enable users to read and process the computerized catalog without the problems and guesswork often associated with such a task. The source reference should be consulted for additional details regarding the measurements, instrument characteristics, reductions, construction of the quasi-absolute system of right ascension, and star positions in the catalog. Author

N82-23081*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION FOR THE MACHINE-READABLE VERSION OF THE ABSOLUTE CALIBRATION OF STELLAR SPECTROPHOTOMETRY
Wayne H. Warren, Jr. Mar. 1982 10 p refs
(NASA-TM-84177; NSSDC/WDC-A-R/S-82-11; NAS 1.15:84177) Avail: NTIS HC A02/MF A01 CSCL 03A

The machine-readable data file of The Absolute Calibration of Stellar Spectrophotometry as distributed by the Astronomical Data Center is described. The data file contains the absolute fluxes for 16 stars published in Tables 1 and 2 of Johnson (1980). The absolute calibrations were accomplished by combining the 13-color photometry calibrations of Johnson and Mitchell (1975) with spectra obtained with a Michelson spectrophotometer and covering the wavelength range 4000 to 10300 A (Johnson 1977). The agreement between this absolute calibration and another recent one based upon data for a Lyr and 109 Vir by Tug, White and Lockwood (1977) is shown by Johnson (1980) to be quite good. A.R.H.

N82-23082*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION FOR THE MACHINE-READABLE VERSION OF THE LUMINOUS STARS IN THE NORTHERN MILKY WAY
Wayne H. Warren, Jr. Apr. 1982 17 p refs
(NASA-TM-84178; NAS 1.15:84178; NSSDC/WDC-A-R/S-82-12) Avail: NTIS HC A02/MF A01 CSCL 03A

A machine-readable version of a catalogue, Luminous Stars in the Northern Milky Way, which contains all stars of six source publications in a single file is described. Files containing lists in order of their publication and sorted by right ascension are included in the computerized catalogue. Additional details regarding the program, instrumentation, spectral classification and determinations of magnitudes and positions are given in the source publications. This document was designed to be distributed with any machine-readable version of the catalogue. M.D.K.

N82-23083*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md. Lab. for Solar Physics and Astrophysics.
TELESCOPES AND SPACE EXPLORATION
John C. Brandt and Stephen P. Maran [1982] 17 p Original contains color illustrations
(NASA-TM-84196; NAS 1.15:84196) Avail: NTIS HC A02/MF A01 CSCL 03A

Progress in contemporary astronomy and astrophysics is shown to depend on complementary investigations with sensitive telescopes operating in several wavelength regions, some of which can be on the Earth's surface and others of which must be in space. N.W.

N82-23084# Royal Greenwich Observatory, Herstmonceux (England).
COMPACT DATA FOR NAVIGATION AND ASTRONOMY FOR 1981 TO 1985
B. D. Yallop (Her Majesty's Nautical Almanac Office) 1981 94 p
(Bull-185; ISSN-0308-5074) Avail: NTIS HC A05/MF A01; Royal Greenwich Obs., Hertsmonceux, England £3

Data required for astronomical navigation using a simple pocket calculator are presented as polynomial coefficients. Formulas and calculation methods which require a programmable calculator are also given. Information on the Sun and planets includes corrections to the observed altitudes and monthly polynomial coefficients. Phases of the Moon, daily coefficients, and altitude corrections are provided. Apparent places of navigational and circumpolar stars, rising and setting times, dip, and refraction are indicated. Author (ESA)

N82-23085# University Coll., Cardiff (Wales). Dept. of Applied Mathematics and Astronomy.
THE ANGLO-AUSTRALIAN TELESCOPE
Fred Hoyle Aug. 1981 65 p Submitted for publication
(Preprint-71) Avail: NTIS HC A04/MF A01

The development of the Anglo-Australian telescope is traced and its contributions to astronomy are mentioned. The tele-

scope incorporates an electronic computerized drive and control system and a Wamplerton. Its uses include investigation of interstellar absorption at 3.4 microns in studies of the nature of interstellar grains. Author (ESA)

N82-23086# European Space Agency, Paris (France).
THE S 59 SPECTROPHOTOMETRIC ATLAS OF THE MIDULTRAVIOLET SPECTRA OF 220 EARLY STARS WITH A RESOLUTION OF 1.8 A
H. J. G. L. M. Lamers (Astronomical Inst., Utrecht), R. Hoekstra (Astronomical Inst., Utrecht), K. A. vanderHucht (Astronomical Inst., Utrecht), T. M. Kauperman (Astronomical Inst., Utrecht), and W. R. Burke, ed. Nov. 1981 214 p refs
(ESA-SP-1038; ISSN-0379-6566) Avail: NTIS HC A10/MF A01; ESA, Paris FF 125

The spectral scans cover the wavelength ranges from 2060 to 2170 A, 2490 to 2600 A, and 2770 to 2880 A. The spectral resolution is 1.8, 2.3 and 1.7 A in the three wavelength channels, respectively. The wavelength scale has an internal accuracy of 0.1 A and an external accuracy of 0.2 A. The intensity calibration within each channel has an accuracy of 2%. The spectra are calibrated with respect to standard stars with an accuracy of 5%. The calibration of the standard stars is accurate to 10%. The spectra presented were obtained by averaging the multiple scans for each star, with a mean of nine scans per star. The spectra are corrected for background and stray light. Author (ESA)

N82-23087 Arizona Univ., Tucson.
THE STOCHASTIC EVOLUTION OF ASTEROIDAL REGOLITHS AND THE ORIGIN OF BRECCIATED AND GAS RICH METEORITES Ph.D. Thesis
Kevin Richard Housen 1981 216 p
Avail: Univ. Microfilms Order No. 8200481

A model is constructed which views regolith evolution on asteroids as a stochastic process. Average values are shown to be poor descriptors of regolith depth. Large deviations from the average are expected to occur due both to variations in the depth over the surface of a body and to stochastic fluctuations in the variables which determine regolith depth, e.g., the number of craters produced on an asteroid. The utility of the average depth is not significantly increased by avoiding large craters of thick deposits; a procedure adopted in previous regolith studies. The statistical uncertainty associated with regolith depth severely limits the power of regolith models in predicting parent body size for brecciated meteorites. Virtually any rocky asteroid target larger than 100 to 200 km in diameter could have produced the abundance of brecciated material observed in the achondritic meteorites. A Monte Carlo algorithm is used to simulate the random walks and corresponding changed particle irradiation histories of grains in regoliths. Dissert. Abstr.

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N82-23088*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
FUNDAMENTAL STUDIES IN X-RAY ASTROPHYSICS Semiannual Progress Report, 15 Oct. 1981 - 14 Apr. 1982
Donald Q. Lamb and Alan P. Lightman Apr. 1982 145 p refs
(Grant NAGW-246)
(NASA-CR-168840; NAS 1.26:168840; PR-1) Avail: NTIS HC A07/MF A01 CSCL 03B

An analytical model calculation of the ionization structure of matter accreting onto a degenerate dwarf was carried out. Self-consistent values of the various parameters are used. The possibility of nuclear burning of the accreting matter is included. We find the blackbody radiation emitted from the stellar surface keeps hydrogen and helium ionized out to distances much larger than a typical binary separation. Except for low mass stars or high accretion rates, the assumption of complete ionization of the elements heavier than helium is a good first approximation. For low mass stars or high accretion rates the validity of assuming complete ionization depends sensitivity on the distribution of matter in the binary system. Author

N82-23089# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
THE ROLE OF CYCLOTRON RESONANCE PROCESSES IN THE SPECTRA OF ACCRETING NEUTRON STARS
Joachim Truemper Sep. 1981 13 p refs Presented at Workshop on Gamma-Ray Transients and Related Astrophys. Phenomena, San Diego, 5-8 Aug., 1981
(MPI-PAE/Extraterr-170; ISSN-0340-8922) Avail: NTIS HC A02/MF A01

The observability of the cyclotron resonance in the X-ray spectra of accreting neutron stars is discussed. Problems arising in the context of gamma-ray burst spectra are addressed. Finally, radiative transfer in homogeneous plasmas under superstrong magnetic field conditions is discussed. J.M.S.

N82-23090 Ohio State Univ., Columbus.
ON SOME ASPECTS OF THE RADIATIVE INTERACTION IN A CLOSE BINARY SYSTEM Ph.D. Thesis
Thomas John Kuzma 1981 151 p
Avail: Univ. Microfilms Order No. 8129048

The equations of radiative transfer for a stellar atmosphere illuminated by an arbitrarily polarized radiation field, are separable into a term for the diffuse field and an incident component. The form of the incident part is determined by the spatial distribution of the incident radiation. The geometry was set up to obtain the incident terms for the general case of illumination from a finite solid angle. These equations reduce to the two extreme cases of plane parallel illumination and uniform illumination from a hemisphere. A model of the early type semidetached binary system V Puppis was constructed based on a Roche model. The effects of illumination from a finite solid angle metallic line blanketing, and non-LTE on the structure, emergent continuum and line radiation, and polarization for the illuminated, less massive component were investigated. Limb darkening curves and isophotes for each component at 930 A, and 5000 A are presented. Incident radiation shifts the apparent center of the illuminated star toward the center of mass of the system, and induces a large horizontal flux on the illuminated star which could effect the surface structure of the atmosphere. Dissert. Abstr.

N82-23091 Ohio State Univ., Columbus.
A SPECTROSCOPIC STUDY OF COMMON PROPER MOTION BINARIES WHICH CONTAIN DEGENERATE COMPONENTS Ph.D. Thesis
Terry Dean Oswalt 1981 150 p
Avail: Univ. Microfilms Order No. 8129072

The spectroscopic properties of faint binaries selected from the Luyter and Gicias, et al., proper motion surveys were analyzed. Roughly one dozen white dwarfs were identified. Based on a comparison of the UBV magnitudes and colors exhibited by the component stars, the existence of at least two groups of degenerate plus nondegenerate binaries was confirmed. These groups are apparently the result of the intrinsic shape of the white dwarf cooling sequence and the downturn in the cool end of the main sequence in the Hertzsprung-Russell diagram as well as observational biases inherent in previous searches for white dwarfs among the common proper motion binaries. The ST vidicon spectra were used to objectively classify and estimate 15 V and R colors of the nondegenerate components using simple measurements of Cal H and Cal 4227, and TiO 4954. The physical association and coevality of the common proper motion binaries containing only nondegenerate components is tested by comparing the strengths of Cal H and K emission exhibited by the components. Dissert. Abstr.

N82-23092 Texas Univ. at Arlington.
CARBON, NITROGEN, AND OXYGEN ABUNDANCES IN G AND K GIANTS Ph.D. Thesis
Lynne Marie Ries 1981 524 p
Avail: Univ. Microfilms Order No. 812868

The abundance of carbon, nitrogen, and oxygen were determined in 32 bright G and K giants in order to test theoretical predictions of nucleosynthesis and convective mixing in evolved stars. Atmospheric parameters were determined from lines of

neutral and ionized iron measured from photographic plates taken with the coude spectrograph on a 2.1 m telescope. These were supplemented by spectra obtained with the coude Reticon on the 2.7 m telescope. Excitation temperatures were determined using a curve of growth technique on the neutral iron lines. Empirical solar oscillator strengths were used. Lineblanketed model atmospheres provides the calibration with effective temperature ionization equilibrium yielded the gravity, while the microturbulence was found by demanding that the iron abundance be independent of line strength. Dissert. Abstr.

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N82-23093*# Smithsonian Astrophysical Observatory, Cambridge, Mass.

RADIOACTIVITIES IN RETURNED LUNAR MATERIALS AND IN METEORITES Semiannual Progress Report, 1 Aug. - 31 Jan. 1982

Edward L. Fireman Jan. 1982 5 p refs

(Grant NGR-09-015-145)

(NASA-CR-167514; NAS 1.26:167514; SAPR-22) Avail: NTIS HC A02/MF A01 CSCL 03B

Carbon-14 measurements were made for meteorites with a Van der Graaf accelerator. Accelerator C-14 dating improved the precision by a factor of ten, allowed the use of smaller sample sizes, and gave speedier results than C-14 dating with counters. A methodology for determining the terrestrial ages of several antarctic meteorites is described and the results are listed. M.G.

N82-23094# Planetary Science Inst., Pasadena, Calif.

THERMAL EMISSION AND MICROWAVE REFLECTIVITY OF VERTICALLY STRUCTURED PLANETARY SURFACE MODELS: APPLICATIONS TO THE LUNAR REGOLITH

Stephen J. Keihm [1982] 91 p refs

Avail: NTIS HC A05/MF A01

The effects of vertical variations in density and dielectric constant on remotely inferred electrical properties of dry planetary regoliths are examined. Specific applications address the vertical structure of the lunar frontside regolith, including constraints imposed from Apollo sample measurements. It is found that vertical variations within one absorption length of the surface produces significant effects upon inferences of dielectric constant based upon radar cross-section and bi-static measurements. For the Moon, large impedance contrasts such as that produced by a soil bedrock interface, result in an increase in radar-inferred dielectric constant for wavelengths longward of 1m for feasible bedrock depths. Models of the rapid increase in soil density characteristic of the upper 10 to 20 cm of the lunar regolith predict a sharp upturn in apparent dielectric constant in the wavelength range 50 to 100 cm. R.J.F.

N82-23095# European Space Agency, Paris (France).

THE COMET HALLEY DUST AND GAS ENVIRONMENT

Bruce Battrick, comp. and Esther Swallow, comp. Nov. 1981 88 p refs Proc. of NASA/ESA Working Group Meeting Heidelberg, 26-27 Aug. 1981

(ESA-SP-174; ISSN-0379-6566) Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 Member States, AU, CN and NO (+20% others)

Comet parameters likely to affect the Giotto mission are discussed. Mathematical models of comet dust, radiation, and optical properties are treated. Data from 1910 observations are used to predict conditions in 1985/6. For individual titles, see N82-23096 through N82-23104.

N82-23096*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

A SEMI-EMPIRICAL PHOTOMETRIC THEORY OF COMETARY GAS AND DUST PRODUCTION: APPLICATION TO P/HALLEY'S GAS PRODUCTION RATES

Ray L. Newburn *In* ESA The Comet Halley Dust and Gas Environ. Nov. 1981 p 3-18 refs (For primary document see N82-23095 13-91)

(Contract NAS7-100)

Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 Member States, AU, CN and NO (+20% others) CSCL 03B

The semiempirical photometric theory of cometary gas and dust production is recalibrated using UV observations from 14 comets and uniform visual photometry from 8 comets. The calibration is not changed significantly but becomes more secure. The complete theory is presented with all approximations evaluated and explained. Numerical calibration aspects are presented in tables. The theory is applied to P/Halley using a light curve without the artifact caused by the close approach to Earth in 1910. Gas production rates predicted for the 1985/86 apparition are similar to those for 1910. Author (ESA)

N82-23097# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

THE DERIVATION OF HALLEY PARAMETERS FROM OBSERVATIONS

R. L. Newburn and R. Reinhard (ESTEC, Noordwijk, Netherlands) *In* ESA The Comet Halley Dust and Gas Environ. Nov. 1981 p 19-24 refs (For primary document see N82-23095 13-91)

Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 Member States, AU, CN and NO (+20% others)

Nominal value model parameters for the nucleus (size, mass, rotation, albedo, hydrogen production) the dust and gas for P/Halley at 0.9 AU postperihelion are derived from the light curve and spectra of Halley and by modeling the effect of the nongravitational forces, e.g., the outgassing rocket type effect of the nucleus. In those cases where Halley observations are not sufficient, the average value derived from a larger set of other comets is used, or data from comet Bennett, Halley's best analog, are taken. A flow diagram shows how the parameter values are derived and to what extent these derived values are interdependent. Author (ESA)

N82-23098*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

NUMERICAL MODELS FOR HALLEY DUST ENVIRONMENTS

Neil Divine *In* ESA The Comet Halley Dust and Gas Environ. Nov. 1981 p 25-30 refs (For primary document see N82-23095 13-91)

(Contract NAS7-100)

Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 Member States, AU, CN and NO (+20% others) CSCL 03B

The algebra, parameter values, and results of a reference model for the dust environment of Comet P/Halley are presented. The model employs simplified treatments of the icy conglomerate nucleus and of the hydrodynamic outflow of gas and dust. The model includes a gas production rate derived from observations of Halley's visual magnitude in 1910, gas and dust flux nonuniformly distributed over the nuclear surface, a dust distribution function consistent with large particle inferences from comet antitails, dust density variable with mass, and an approximation to the distribution of particles near the dust envelope. Many parameter values are derived by analogy with the results for other comets. The features are incorporated in a computer program which calculates the concentration, flux, and fluence of dust particles as functions of time, position and particle mass. Author (ESA)

N82-23099# Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).

DEFINITION OF MODEL PARAMETERS AND NUMERICAL FLYBY SIMULATIONS

R. Hellmich and H. U. Keller (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany) *In* ESA The Comet Halley Dust and Gas Environ. Nov. 1981 p 31-39 refs (For primary document see N82-23095 13-91)

Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 Member States, AU, CN and NO (+20% others)

An energy balance at the surface of the cometary nucleus

leads to initial conditions for a hydrodynamic calculation from which the structure of the inner dust coma is obtained. The feedback of the insolation on the sublimation process is taken into account. In the outer dust coma spatial structure of the dust density is inflenced by solar radiation pressure. Numerical results, illustrating the structure of the dust halo, are presented. The logical connection between parent and daughter parameters of the problem is illustrated by a flow chart. Simulation of the Giotto flyby shows that the satellite takes 91.32 min for its journey through the dust halo, collecting 1.784.104 particles/sq m. Author (ESA)

N82-23100# Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).

COMA OPACITY AND SURFACE CONTRAST

R. Hellmich and H. U. Keller (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany) *In* ESA The Comet Halley Dust and Gas Environ. Nov. 1981 p 41-46 refs (For primary document see N82-23095 13-91)

Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 Member States, AU, and NO (+20% others)

Parameters which describe the visibility of the cometary nucleus within the dust coma are derived. The ratio of radiation scattered by a dust column to the radiation reaching the observer directly from the nucleus influences the contrast deterioration of features on the surface; the visibility of the whole nucleus depends on the ratio of light coming from the direction of the nucleus to that of an adjacent line of sight passing the nucleus. These ratios are calculated for the date of the Giotto spacecraft flyby of comet Halley. The single scattering calculations are based on dust particle densities in the coma derived from a hydrodynamical sublimation model. Mie theory is used to calculate the radiation properties of olivine dust particles. During the Giotto encounter with comet Halley, the contrast on the nuclear surface may be impaired, so imaging experiments must be geared to highest possible contrast resolution. Nucleus shape and size remain discernable under adverse conditions. Author (ESA)

N82-23101*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

A SIMPLE RADIATION MODEL OF COMETARY DUST FOR P/HALLEY

Neil Divine *In* ESA The Comet Halley Dust and Gas Environ. Nov. 1981 p 47-53 refs (For primary document see N82-23095 13-91)

(Contract NAS7-100)

Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 Member States, AU, CN and NO (+20% others) CSCL 03B

Algebra, parameter values, and results for a model of the radiation from the dust environment of Comet P/Halley are presented. The model includes absorption and single scattering of sunlight and IR emission, for the dust and nucleus. It employs dust particle photometric properties which are independent of wave length, particle size, and position within the coma, separately in the visible and IR regions. Values for these properties are obtained from published photometric data for several comets, and are applied to a numerical model for the dust distribution near Halley. A calculation for a spacecraft 1081 km sunward of Halley's nucleus (at 1.05 AU, postperihelion) leads to omnidirectional, integral flux values of 1235 W/sqm for direct sunlight, 0.24 W/sqm for dust IR emission, 0.095 W/sqm for sunlight scattered from the dust, 0.0015 W/sqm for sunlight reflected from the nucleus, and 0.00033 W/sqm for nucleus IR emission. Author (ESA)

N82-23102*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

PROPERTIES OF DUST PARTICLES IN COMET HALLEY FROM OBSERVATIONS MADE IN 1910 DURING ITS ENCOUNTER WITH THE EARTH

Zdenek Sekanina *In* ESA The Comet Halley Dust and Gas Environ. Nov. 1981 p 55-65 refs (For primary document see N82-23095 13-91)

(Contract NAS7-100)

Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 Member States, AU, CN and NO (+20% others) CSCL 03B

Observations of the dust tail of Comet Halley about the time of the Earth's transit across the orbit plane of the comet are analyzed. The Earth grazed the tail, whose apparent length reached up to 150 deg. The maximum acceleration the ejecta were subjected to by solar radiation pressure is approximately 2.5 times the solar attraction. This acceleration indicates the presence of submicron sized, strongly absorbing particles. Their detectable contribution to the tail's brightness is limited to the immediate proximity of the orbit plane because of a low reflectivity and/or a low spatial density. The width of the tail, observed edgewise at the time of transit, is determined by particles whose beta = 05, possibly submicron sized dielectric grains. Their derived ejection velocity = 450 m/sec. Author (ESA)

N82-23103*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

EFFECT OF THE SIZE DISTRIBUTION ON THE THERMAL EMISSION FROM COMETARY DUST

Martha S. Hanner *In* ESA The Comet Halley Dust and Gas Environ. Nov. 1981 p 67-75 refs (For primary document see N82-23095 13-91)

Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 Member States, AU, CN and NO (+20% others) CSCL 03B

The IR thermal emission from cometary dust is analyzed by two size distribution functions, Sekanina A and a modified Sekanina Miller distribution. The resulting thermal emission spectra are illustrated for heliocentric distances 0.15 to 1.6 AU. The Sekania A distribution does not predict the observed heliocentric variation in the flux ratio I (4.8 micron) I (3.5 micron) for bright comets. A size distribution intermediate between the two presented is a better representation of the dust in recently observed comets. Author (ESA)

N82-23104# Ruhr Univ., Bochum (West Germany). Bereich Extraterrestrische Physik.

OPTICAL AND PHYSICAL PROPERTIES AND DYNAMICS OF DUST GRAINS RELEASED BY COMET HALLEY

G. H. Schwehm and B. Kneissel *In* ESA The Comet Halley Dust and Gas Environ. Nov. 1981 p 77-84 refs (For primary document see N82-23095 13-91)

Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 Member States, AU, CN and NO (+20% others)

The existence of an ice halo in the tail of Halley's comet during the Giotto flyby is studied. The optical properties of coated and irregular shaped particles are reviewed in order to derive a zero order approximation of a scattering function for comeraty dust particles. The ratio of the radiation pressure exerted on grains to solar gravitational attraction is discussed for low density and ice coated particles. Based on these values and the derived temperature distribution of the dust particles, results on the dynamics of evaporating ice grains in the coma of comet Halley for the encounter geometry are presented. The maximum extent of an ice halo consisting of pure ice is 1 million km.

Author (ESA)

N82-23112*# Saint Andrews Presbyterian Coll., Laurinburg, N.C.

WEATHERING OF IRON SULFIDES UNDER MARS SURFACE AMBIENT CONDITIONS

Thomas R. Blackburn *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 28 p refs (For primary document see N82-23108 13-99)

Avail: NTIS HC A14/MF A01 CSCL 03B

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N82-23105# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.

DRIFTING FIBERS IN SOLAR TYPE 4 RADIO BURSTS: OBSERVATIONS AND THEORY OF RADIATION IN PRESENCE OF LOCALIZED WHISTLER TURBULENCE

Thomas E. X. Bernold (Eidgenoessische Technische Hochschule) and Rudolf A. Treumann Aug. 1981 76 p refs (MPI-PAE/Extraterr-168; ISSN-00340-8922) Avail: NTIS HC A05/MF A01

Digital observations of fiber fine structures during the type 4 solar radio burst of October 1, 1978 are presented and analyzed. The results are summarized in histograms. Typical values for drift-rates range between -2.3 and -9.9 MHz/s. Frequency intervals between absorption and emission within the spectrum were measured to be within 0.9 and 2.7 MHz angular frequency. Several types of spectra are discussed. A theoretical interpretation based upon the model of a population of electrons trapped within a magnetic mirror loop configuration shows that the fiber emission can be explained assuming an interaction between spatially localized strong whistler turbulence (solitons) and a broadband Langmuir wave spectrum. Ducting of the whistler solitons in low density ducts provides a plausible explanation for their coherent behavior during the lifetime of an individual fiber. J.M.S.

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N82-23106 National Physical Lab., Teddington (England).
A GUIDE TO THE MEASUREMENT OF ENVIRONMENTAL GAMMA-RAY DOSE RATE
F. W. Spiers (Cookridge Hospital, Leeds, U.K.), J. A. B. Gibson (Atomic Energy Research Dept., Harwell, U. K.), and I. M. G. Thompson (Central Electricity Generating Board, Berkely, U. K.) 1981 118 p refs
(ISBN-0-9504496-7-9) Copyright. Avail: Issuing Activity

The performance of Geiger counters, ionization chambers, scintillators, gamma-ray spectrometers and thermoluminescence dosimeters is discussed. Cosmic, man made, and natural environmental gamma radiation is considered. Dosimeter calibration, measurement procedures, precautions which reduce errors, accuracy assessment, and the interpretation of results are covered. The calculation of dose equivalent to body organs is outlined. Levels of the annual dose equivalent received by the UK population are given. The minimum change in measured dose rate significant at the 95% confidence level as an estimate of the mean environmental dose rate is 12mrad/yr.
Author (ESA)

N82-23107# Aerospace Corp., El Segundo, Calif. Satellite Systems Div.
ENERGETIC PROTON FLUXES AT SYNCHRONOUS ALTITUDE: 23 AUGUST 1972 - 7 AUGUST 1979
E. F. Martina and S. A. Yinger 2 Mar. 1981 105 p
(Contract F04701-80-C-0081)
(TOR-0081(6409-34)-1) Avail: NTIS HC A06/MF A01

The omnidirectional flux of protons in too energy bands, 10 to 30 MWEV and 50 to 100 MEV, are plotted for those days of activity in the time span 23 August 1972 through 7 August 1979. The source of the data is satellite 1971 39A, which was located at approximately 75 E longitude during the entire data collection period. It was positioned at synchronous altitude with an inclination of 1.2 degrees in August 1972, growing to 6.4 degrees by August 1979. Therefore, the measurements were made over a range of 4 to 16 degrees south magnetic latitude. The data are single samples taken every 15 min over the entire 7 year interval. The days selected are those that showed a maximum low energy proton flux greater than 40 protons/cu sec, the background in that channel. Fluxes for the events plotted were numerically integrated over the duration of each event. R.J.F.

N82-22547*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
OVERVIEW: WESTERN REGIONAL APPLICATIONS PROGRAM (WRAP) STATUS
Susan M. Norman *In its* Western Reg. Remote Sensing Conf. Proc., 1981 Sep. 1981 p 2-7 ERTS (For primary document see N82-22546 13-43)
Avail: NTIS HC A12/MF A01 CSCL 05B

99 GENERAL

N82-23108*# Houston Univ., Tex.
THE 1981 NASA ASEE SUMMER FACULTY FELLOWSHIP PROGRAM, VOLUME 1 Technical Final Report
Nancy G. Robertson and C. J. Huang 20 Aug. 1981 324 p refs 2 Vol.
(Grant NGT-44-005-115)
(NASA-CR-168775; NAS 1.26:168775) Avail: NTIS HC A14/MF A01 CSCL 05I

A review of NASA research programs related to developing and improving space flight technology is presented. Technical report topics summarized include: space flight feeding; aerospace medicine; reusable spacecraft; satellite soil, vegetation, and climate studies; microwave landing systems; anthropometric studies; satellite antennas; and space shuttle fuel cells. For individual titles, see N82-23109 through N82-23121.

N82-23109*# Texas Southern Univ., Houston. Medical Research Branch.
EXPERIMENTAL STUDY OF HIGH DENSITY FOODS FOR THE SPACE OPERATIONS CENTER Final Report c54
Selina M. Ahmed *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 22 p refs (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 06H

The experimental study of high density foods for the Space Operations Center is described. A sensory evaluation of the high density foods was conducted first to test the acceptability of the products. A shelf-life study of the high density foods was also conducted for three different time lengths at three different temperatures. The nutritional analysis of the high density foods is at present incomplete. M.D.K.

N82-23110*# Kentucky State Univ., Frankfort. Dept. of Biology.
CARDIOVASCULAR ADAPTATIONS IN WEIGHTLESSNESS: THE INFLUENCE OF IN-FLIGHT EXERCISE PROGRAMS ON THE CARDIOVASCULAR ADJUSTMENTS DURING WEIGHTLESSNESS AND UPON RETURNING TO EARTH c52
Charles H. Bennett *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 37 p refs (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 06S

The effect of in-flight exercise programs on astronauts' cardiovascular adjustments during spaceflight weightlessness and upon return to Earth was studied. Physiological changes in muscle strength and volume, cardiovascular responses during the application of lower body negative pressure, and metabolic activities during pre-flight and flight tests were made on Skylab crewmembers. The successful completion of the Skylab missions showed that man can perform submaximal and maximal aerobic exercise in the weightless enviroment without detrimental trends in any of the physiologic data. Exercise tolerance during flight was unaffected. It was only after return to Earth that a tolerance decrement was noted. The rapid postflight recovery of orthostatic and exercise tolerance following two of the three Skylab missions appeared to be directly related to total in-flight exercise as well as to the graded, regular program of exercise performed during the postflight debriefing period. M.D.K.

N82-23111*# Houston Univ., Clear Lake, Tex.
INTERNATIONAL AEROSPACE ENGINEERING: NASA SHUTTLE AND EUROPEAN SPACELAB c16
Roger E. Bilstein *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 26 p refs (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 22B

NASA negotiations and contractual arrangements involving European space research organizations' participation in manned space operations and efforts in building Spacelab for the U.S. Reusable Space Shuttle are discussed. Some of the diplomatic and technical collaboration involved in the international effort is reviewed. M.D.K.

N82-23112*# Saint Andrews Presbyterian Coll., Laurinburg, N.C.
WEATHERING OF IRON SULFIDES UNDER MARS SURFACE AMBIENT CONDITIONS c91
Thomas R. Blackburn *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 28 p refs (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 03B

The study of iron sulfide surface alternation reactions under Mars' surface ambient conditions begun during 1980 was extended through improved irradiation design and experimental protocols. A wider range of humidities and more intense irradiation were incorporated in the study. X-ray photoelectron spectra of irradiated chips suggest formation of FeSO4, FeCO3, and an iron oxide on the iron sulfide substrates studied. M.D.K.

N82-23113*# Arkansas Coll., Batesville.
DETERMINATION OF WATER-SOLUBLE IONS IN SOILS FROM THE DRY VALLEYS OF ANTARCTICA c46
Roberta Bustin *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 16 p refs (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 08M

The soil chemistry of the dry valleys of Antarctica was studied. These valleys furnish a terrestrial analog for the surface of Mars. The abundance of the water-soluble ions magnesium, calcium, potassium, sodium chloride, and nitrate in soil samples was determined. All samples examined contained water-soluble salts reflecting the aridity of the area. Movement of salts to low-lying areas was verified. Upward ionic migration was evident in all core samples. Of all cations observed, sodium showed the greatest degree of migration. M.D.K.

N82-23114*# Houston Univ., Tex. Tracking and Communications Development Div.
EFFECTS OF RAIN AND FOG ON THE SHUTTLE KU-BAND MICROWAVE SCANNING BEAM LANDING SYSTEM RANGE AND ACCURACY PERFORMANCE c32
Dennis Butler *In its* The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 33 p refs (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 17B

The microwave Scanning Beam Landing System's (MSBLS) performance in fog and rain was studied. The fog and rain effects on the Shuttle Ku-band system were determined. Specifically, microwave attenuation, beam distortion, and coordinate errors resulting from operation of the MSBLS in poor weather conditions were evaluated. The main physical processes giving rise to microwave attenuation were found to be absorption and scattering by water droplets. The general theory of scattering and absorption used is discussed and a listing of applicable computer programs is provided. M.D.K.

N82-23115*# Houston Univ., Tex.
ANTHROPOMETRIC DATA ERROR DETECTING AND CORRECTION WITH A COMPUTER c54
David D. Chesak (St. Joseph's College) *In its* The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 12 p refs (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 05H

Data obtained with automated anthropometric data aquisition equipment was examined for short term errors. The least squares curve fitting technique was used to ascertain which data values were erroneous and to replace them, if possible, with corrected values. Errors were due to random reflections of light, masking of the light rays, and other types of optical and electrical interference. It was found that the signals were impossible to eliminate from the initial data produced by the television cameras, and that this was primarily a software problem requiring a digital computer to refine the data off line. The specific data of interest was related to the arm reach envelope of a human being. M.D.K.

N82-23116*# Evangel Coll., Springfield, Mo.
USE OF LANDSAT DATA TO DEFINE SOIL BOUNDARIES IN CARROLL COUNTY, MISSOURI c43
Steve E. Davidson *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 12 p refs (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 08M

Bands 4, 5 and 7 false color composite photographs were prepared using data from LANDSAT scenes acquired during April 1977 and April 1981 on computer compatible tapes, and these color composites were compared with band 7 black and white photographs prepared for the entire county. Delineations of soil boundaries at the soil association level were achieved using LANDSAT spectral reflectance data and slope maps for a portion of Carroll County, Missouri. Forty two spectral reflectance classes from April 1977 LANDSAT data were overlaid on digitized slope maps of nine USGS 7.5 minute series topographic quadrangle slope maps to achieve boundary delineations of the soil associations. Author

N82-23117*# Houston Univ., Tex.
INVESTIGATION OF A SOLID STATE POWER COMBINING ANTENNA PROPOSED FOR USE IN THE SOLAR POWER SATELLITE c32
Larry A. Farmer (Kansas Technical Inst.) *In its* The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 28 p refs (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 10A

Performance tests performed on a four-feed microstrip antenna and feed network are analyzed. Frequency response with and without amplifiers, an investigation of noise threshold, phase tracking, and jitter are included. Recommendations for further development of SPS power conversion modules are also included. Author

N82-23118*# Houston Univ., Tex. Mission Planning and Analysis Div.
NONLINEAR COUPLING BETWEEN THE IN-PLANE AND OUT-OF-PLANE MOTION ABOUT A STATIONARY POINT IN GEOSYNCHRONOUS ORBIT c13
Bruce R. Feiring *In its* The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 18 p refs (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 22A

The range of validity of the solutions in the vicinity of the libration points include significant out-of-plane oscillations by the satellite. The stability of inclined geosynchronous satellites is studied. N.W.

N82-23119*# Texas A&M Univ., College Station. Dept. of Meteorology.
TEMPORAL CHANGES OF THE GLOBAL REFLECTANCE OF A WHEAT FIELD AS A FUNCTION OF DAILY SOLAR IRRADIANCE c43
Guy A. Franceschini *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 21 p (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 02C

Based on in situ measurements of incident and reflected solar irradiation over a wheat field, daily values of the surface reflectance, a scene signature, were determined for a crop year. Diagnoses of these data reveal the character of the signature, and its changes with time, crop stage, and the magnitude of incident irradiance. The latter varies inversely with cloud cover. Author

N82-23120*# Nebraska Wesleyan Univ., Lincoln. Dept. of Biology.
A GRADIENT MODEL OF VEGETATION AND CLIMATE UTILIZING NOAA SATELLITE IMAGERY. PHASE 1: TEXAS TRANSECT c47
David H. Greegor, Jr. and Jim Norwine (Texas A&I Univ., Kingsville) *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 63 p refs (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 04B

A new experimental climatological model/variable termed the sponge, a measure of moisture availability based on daily temperature maxima and minima and precipitation, is tested for potential biogeographic, ecological, and agro-climatological applications. Results, depicted in tabular and graphic from, suggest that, as a generalized climatic index, sponge's simplicity and sensitivity make particularly appropriate for trans-regional

biogeographic studies (e.g., large-area and global vegetation monitoring). The feasibility of utilizing NOAA/AVHRR data for vegetation classification was investigated and a vegetation gradient model that utilizes sponge, and AVHRR pixel data (channels 1 and 2) were obtained for 12 locations. The normalized difference values for the AVHRR data when plotted against vegetation characteristics (biomass, net productivity, leaf area) and sponge values suggest that a multivariate gradient model incorporating AVHRR and sponge data may indeed be useful in global vegetation stratification and monitoring. Author

N82-23121*# Le Tourneau Coll., Longview, Tex.
ORBITER FUEL CELL IMPROVEMENT ASSESSMENT c44
Richard E. Johnson *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 1 20 Aug. 1981 27 p refs (For primary document see N82-23108 13-99)
Avail: NTIS HC A14/MF A01 CSCL 10A

The history of fuel cells and the theory of fuel cells is given. Expressions for thermodynamic and electrical efficiencies are developed. The voltage losses due to electrode activation, ohmic resistance and ionic diffusion are discussed. Present limitations of the Orbiter Fuel Cell, as well as proposed enhancements, are given. These enhancements are then evaluated and recommendations are given for fuel cell enhancement both for short-range as well as long-range performance improvement. Estimates of reliability and cost savings are given for enhancements where possible. Author

N82-23122*# Houston Univ., Tex.
THE 1981 NASA ASEE SUMMER FACULTY FELLOWSHIP PROGRAM, VOLUME 2 Final Technical Report
Nancy G. Robertson and C. J. Huang 20 Aug. 1981 380 p refs 2 Vol.
(Grant NGT-44-005-115)
(NASA-CR-168776; NAS 1.26:168776) Avail: NTIS HC A17/MF A01 CSCL 05I

A collection of papers on miscellaneous subjects in aerospace research is presented. Topics discussed are: (1) Langmuir probe theory and the problem of anisotropic collection; (2) anthropometric program analysis of reach and body movement; (3) analysis of IV characteristics of negatively biased panels in a magnetoplasma; (4) analytic solution to classical two body drag problem; (5) fast variable step size integration algorithm for computer simulations of physiological systems; (6) spectroscopic experimental computer assisted empirical model for the production of energetics of excited oxygen molecules formed by atom recombination shuttle tile surfaces; and (7) capillary priming characteristics of dual passage heat pipe in zero-g. For individual titles, see N82-23123 through N82-23136.

N82-23123*# Arizona State Univ., Tempe. Dept. of Physics.
LANGMUIR PROBE THEORY AND THE PROBLEM OF ANISOTROPIC COLLECTION Final Report c64
A. Kyrala *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 38 p refs (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 12A

A more general understanding of Langmuir probe theory by going beyond particular coordinate systems as far as possible was studied. To delineate the role of initial velocities in the problem and to characterize the interaction between the velocity flow field and the electrostatic potential field both of which enter into the determination of particle trajectories are desired. The probe is supposed to be negatively charged throughout and the ensuing region of positive space charge about it differs fundamentally from the plasma region beyond in the sense that the former represents a region in which deterministic trajectories dominate while the lattice is a region dominated by statistical interactions largely controlled by the collisionless stationary Boltzmann equation. A general solution of this Boltzmann equation is given and its relationship to the problem of saturation current density in 3D is elucidated. E.A.K.

N82-23124*# Houston Univ., Tex.
ANTHROPOMETRIC PROGRAM ANALYSIS OF REACH AND BODY MOVEMENT Final Report c54
Charles J. McKinley *In its* The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 16 p refs (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 05H

A multifaceted project involving tasks related to anthropometric data collection and comparison is discussed. Activities relating to human force and motion capabilities and information on astronaut candidates doing certain force and motion activites were studied. The subjects were suited, both in one-G and in neutral buoyancy of a water facility, and also unsuited, in a one-G environment. Pieces of hardware used in quantification of the data collection were reviewed. The hardware included a CYBEX 2 force and torque machine, and a three dimension camera system (AMS) for measuring range of motion envelopes. Collecting techniques are compared and standardization of data collection is suggested. E.A.K.

N82-23125*# Central Missouri State Univ., Warrensburg.
ANALYSIS OF I-V CHARACTERISTICS OF NEGATIVELY BIASED PANELS IN A MAGNETO-PLASMA Final Report c75
Donald D. Miller *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 39 p refs (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 20I

Current voltage characteristics of negatively biased panels placed in a plasma environment were analyzed for panel size, electron density, and superimposed magnetic field. It is indicated that the thickness of the surrounding sheath and its rate of growth with bias potential depends on all these parameters in a nonlinear manner. E.A.K.

N82-23126*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AN ANALYTIC SOLUTION TO THE CLASSICAL TWO-BODY PROBLEM WITH DRAG Final Report c02
Don Mittleman (Oberlin Coll.) and Don Jezewski *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 22 p refs (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 01A

The two body problem was analyzed with a specific drag model. The model treats drag as a force proportional to the vector velocity and inversely proportional to the distance to the center of attraction. The solution is expressed in terms of known functions and is of a simple and compact form. The time of flight is expressed as a quadrature in the true anomaly. The results are: (1) development of a vector differential equation which allows analysis of an infinite number of gravitational and drag models; and (2) obtaining the solution of a linear differential equation using the inverse method of laplace transforms. E.A.K.

N82-23127*# Tennessee Technological Univ., Cookeville.
A FAST VARIABLE STEP SIZE INTEGRATION ALGORITHM SUITABLE FOR COMPUTER SIMULATIONS OF PHYSIOLOGICAL SYSTEMS Final Report c61
Larry Neal *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 14 p refs (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 09B

A simple numerical algorithm was developed for use in computer simulations of systems which are both stiff and stable. The method is implemented in subroutine form and applied to the simulation of physiological systems. E.A.K.

N82-23128*# Murray State Univ., Ky.
A SPECTROSCOPIC EXPERIMENTAL AND COMPUTER-ASSISTED EMPIRICAL MODEL FOR THE PRODUCTION AND ENERGETICS OF EXCITED OXYGEN MOLECULES FORMED BY ATOM RECOMBINATION ON SHUTTLE TILE SURFACES Final Report c16
David Allan Owan *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 53 p refs (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 22B

A visible emission spectroscopic method was developed. The amounts of excited singlet and triplet oxygen molecules produced by recombination on the Space Shuttle Orbiter thermal protective tiles at elevated temperatures are determined. Rate

constants and energetics of the extremely exothermic reaction are evaluated in terms of a chemical and mathematical model. Implications for potential contribution to Shuttle surface reentry heating fluxes are outlined. E.A.K.

N82-23129*# Texas A&M Univ., College Station.
CAPILLARY PRIMING CHARACTERISTICS OF A DUAL PASSAGE HEAT PIPE IN ZERO-G Final Report c34
George P. Peterson *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 50 p (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 20D

Technical improvements of a long life heat rejection system, suitable for long duration high power missions, that can be constructed and deployed in orbit is discussed. A mathematical model is formulated and a computer program developed which describes the transient priming characteristics of a dual passage heat pipe. An experimental test package is described for flight in the KC-135 Zero-g Aircraft, to be used to verify the modeling predictions. E.A.K.

N82-23130*# Puerto Rico Univ., Rio Piedras.
ANALYSIS OF LOW-G HEAT TRANSFER FOR A CRYOGENIC OXYGEN PRESSURIZATION HEATER Final Report c34
Joe Rios *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 38 p refs (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 20D

After the external tank separates from the Orbiter about 2000 pounds of residual liquid oxygen remain in the main propulsion system lines. The pressurization of liquid oxygen from a subcritical to a supercritical state by the use of the heaters of the PRSA tanks while in a low-g environment is investigated. The performance of the heaters while bringing the state of the substance from the subcritical state to the supercritical one is studied, with particular emphasis on the time the pressurization process takes, and the temperature of the heater as the process proceeds. S.L.

N82-23131*# Norwalk State Technical Coll., Conn.
EFFECT OF SHEAR STRESS ON CELL CULTURES AND OTHER REACTOR PROBLEMS Final Report c34
Howard Schleier *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 19 p (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 20D

Anchorage dependent cell cultures in fluidized beds are tested. Feasibility calculations indicate the allowed parameters and estimate the shear stresses therein. In addition, the diffusion equation with first order reaction is solved for the spherical shell (double bubble) reactor with various constraints. S.L.

N82-23132*# Buffalo State Univ. Coll., N.Y. Dept. of Geosciences.
THE TECTONICS OF ANORTHOSITE MASSIFS Final Report c46
Carl K. Seyfert *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 29 p refs (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 08G

Anorthosite massifs developed approximately 1.4 to 1.5 billion years ago along an arch which developed parallel to a zone of continental separation as a block which included North America, Europe, and probably Asia separated from a block which included parts of South America, Africa, India, and Australia. Anorthosite massifs also developed at the same time along a belt which runs through the continents which comprise Gondwanaland (South America), Africa, India, Australia, and Antarctica. This was a zone of continental separation which subsequently became a zone of continental collision about 1.2 billion years ago. The northern anorthosite belt also parallels an orogenic belt which was active between 1.8 and 1.7 billion years ago. Heat generated during this mountain building period helped in the formation of the anorthosites. S.L.

N82-23133*# Mississippi State Univ., State College.
A COMPARISON OF STRATIFIED VERSUS REGRESSION ESTIMATORS Final Report c43
Helen Calvert Takacs *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 17 p refs (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 05B

LANDSAT data acquired over an agricultural area along with ground enumeration of the same area are used to obtain crop acreage estimates which are better (as measured in terms of bias and variance) than can be obtained from either data source alone. Two basic approaches considered within the AgRISTARS program are a stratified crop acreage estimator and a regression estimator. A statement of the problem was mathematically formulated and some theorems were proved which relate to the variance of the two estimators. For a particular set of data, the regression and stratified estimators are compared in terms of certain easily computed parameters. S.L.

N82-23134*# Virginia Univ., Charlottesville.
OPTIMAL USE OF ELECTROPHYSIOLOGICAL INDICATORS OF MUSCULAR EFFORT AND FATIGUE Final Report c52
Otis L. Updike *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 15 p refs (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 06S

Electromyograms (EMG) from working muscles convey information on effort and fatigue. Their application, e.g., to assess the demands of vehicle control tasks, is complicated by the cooperative action of sets of muscles, by both intrinsic and imposed filtering, and by numerous other sources of variation. Fourier analyses of these noise like signals offer one approach to interpretation; downward spectral shifts accompany fatigue. Techniques are being sought (in both time and frequency domains) for further condensing the wideband EMG signals, while retaining essential information, into a concise 'state vector' usable in comparing control system designs. S.L.

N82-23135*# Houston Baptist Univ., Tex.
MEASUREMENT OF TRACE LEVELS OF CHLORINE IN THE STRATOSPHERE Final Report c46
Doris C. Warren *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 15 p refs (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 04A

Mathematical models of stratospheric ozone have predicted a reduction in the total ozone due to chlorofluoromethanes released into the atmosphere. Analytical procedures for the collection of air in the stratosphere and for analysis of these air samples for trace levels of chlorine, regardless of the state of chemical composition were developed. Calibration experiments are conducted in order to validate all methods and procedures. Results of neutron activation analysis calibration procedures using standard chlorine gases are included. S.L.

N82-23136*# Ripon Coll., Wis.
COMPUTER SIMULATION OF CURRENT COLLECTION IN A PLASMA ENVIRONMENT Final Report c75
Dino Zei *In* Houston Univ. The 1981 NASA ASEE Summer Fac. Fellowship Program, Vol. 2 20 Aug. 1981 15 p (For primary document see N82-23122 13-99)
Avail: NTIS HC A17/MF A01 CSCL 20I

The pattern of current collection by a biased strip of stainless steel placed in the plasma environment produced by a 30 cm Kaufman ion thruster is studied. Two positions of the collector relative to the ion source were used. Edge on, in which case currents were measured on both sides of the collector, and face on, in which case currents were again measured on both sides of the collector. In the latter case, the surface of the collector that faces the ion thruster is referred to as the front face, the other side as the back face. A qualitative summary of the experimental results is presented. S.L.

N82-23137# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Zentralbereich Entwicklung.
RESEARCH AND DEVELOPMENT AT MBB. TECHNICAL AND SCIENTIFIC PUBLICATIONS, 1981 [FORSCHUNG UND ETWICKLUNG. TECHNISCH-WISSENSCHAFTLICHE VEROEFFENTLICHUNGEN 1981]
1981 193 p refs Partly in ENGLISH and GERMAN

Avail: NTIS HC A09/MF A01

Research and development work carried out during 1981 at Messetschmitt-Bolkow-Blohm GmbH, Ottobrunn, FRG is presented. Aerodynamics, materials science, infrared imagery, aircraft and spacecraft design, and production engineering are discussed. Calculation methods, mathematical and scale models, and computer aided design are treated. Solar energy and high speed trains were investigated. For individual titles, see N82-23138 through N82-23149.

N82-23138# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). De)t. of Aerodynamics.

AERODYNAMIC CHARACTERISTICS OF BODIES WITH RECTANGULAR CROSS SECTION c15

Hans G. Knoche, Werner Schamel, Helmut Esch (DFVLR, Cologne), and Wolfgang Schneider (DFVLR, Cologne) *In its* Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 11 p refs Presented at 19th AIAA Aerospace Sci. Meeting, St. Louis, Mo., 12-12 Jan. 1981 Sponsored by West German Ministry of Defense (For primary document see N82-23137 13-99)
(MBB-UA-570-81-OE) Avail: NTIS HC A09/MF A01

Systematic wind tunnel tests for a series of missile bodies were conducted by varying cross section shape and body length in the subsonic Mach number range and up to high angles of attack. Tests with a body-wing and a body-tail configuration were performed in order to investigate the body-wing and body-tail interference for bodies of revolution and bodies with rectangular cross section. At a constant angle of attack, the boxlike body supplies far more normal force than the body of revolution with the same cross section area. The boxlike body shows strong coupling effects between the pitch, yaw and roll. The interference effect of the wing and body can be described well, in the case of boxlike bodies with wings in high or low wing positions, by the known slender body interference factors, assuming the width of the box to be the diameter of an equivalent, axially symetrical body. Author (ESA)

N82-23139# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Corporate Central Development.

SENSITIVITY AND RESOLUTION CRITERIA FOR INFRARED CAMERAS WITH ARRAY DETECTORS AND ANALYSIS FOR HIGH SPEED COMPUTATION REQUIREMENTS c35

Horst Prem, George W. Stroke, and Jean-Pierre Fouilloy (Telecommunications, Radioelectriques et Telephoniques Corp.) *In its* Res. and Develop. at MMB. Tech. and Sci. Publ. 1981 1981 5 p refs Presented at SPIE's Adv. Program LA 82 Los Angeles Tech. Symp. and Exhibition, Los Angeles, 29 Jan. 1982 (For primary document see N82-23137 13-99)
(MBB-Z-3-81-OE) Avail: NTIS HC A09/MF A01

Correlating field-test performance of IR imaging systems with minimum resolvable temperature difference (MRTD) values is discussed. Sensitivity and resolution theory of IR systems is reviewed. Systems can be characterized by three parameters: sensitivity, scan lines per object height, and channel capacity. Correlation problems are overcome by uncoupling sensitivity and resolution parameters. A comparison of the sensitivity and resolution parameters with the MRTD curves for two images of the same scene obtained with typical instruments validates the uncoupling approach. Author (ESA)

N82-23140# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Military Aircraft Div.

EXPERIENCE WITH HIGH PERFORMANCE V/STOL FIGHTER PROJECTS AT MBB c05

Felix Aulehla and Gerhard K. Kissel *In its* Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 16 p refs Presented at AIAA/NASA Ames V/STOL Conf., Palo Alto, Calif. 7-9 Dec. 1981 (For primary document see N82-23137 13-99)
(MBB-FE-124/S/PUB/50) Avail: NTIS HC A09/MF A01

Experience gained with V/STOL aircraft having the capability to reach Mach 2 and to take off at after-burning temperatures is described. The German project VJ 101 C and the U.S./FRG project AVS as well as the joint U.S./FRG V/STOL Technology Program serve as examples. Guidance and control systems are depicted, including hover and transition control. Jet interference aspects, e.g., hot gas ingestion during take off with reheated jets are described. Author (ESA)

N82-23141# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Aeroelastic Branch.

APPLICATION OF A STRUCTURAL OPTIMIZATION PROCEDURE FOR ADVANCED WINGS c05

Heinrich Goedel and Guenter Schneider *In its* Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 15 p refs Presented at 51st AGARD Meeting on Struct. and Mater. Panel, Aix-en-Provence, France, 14-19 Sep. 1981 (For primary document see N82-23137 13-99)
(MBB-FE-171/S/PUB/49; AGARD-691) Avail: NTIS HC A09/MF A01

A finite element method optimization program was applied to: the sizing of a simplified metal wing for strength and flutter constraints; aeroelastic efficiency calculations for fin and rudder; and the structural layout of a carbon fiber composite delta wing. A flutter speed is calculated for the initial fully stressed design being 700 kt. After 5 iterations the desired flutter speed of 900 kt is reached with an increase < 3% total weight. Good correlation with more sophisticated analyses, e.g., NASTRAN is achieved. The aeroelastic deformation of a fin and rudder are calculated statisfactorily without iteration using the aerodynamic influence matrix produced by a separate program module. A 5% weight saving is achieved for the delta wing. Aileron aeroelastic efficiency is above specification for a supersonic roll.
Author (ESA)

N82-23142# Vereinigte Flugtechnische Werke G.m.b.H., Bremen (West Germany).

CALCULATION OF TWO DIMENSIONAL VISCOUS FLOWS BASED ON AN INVERSE BOUNDARY LAYER SOLUTION [BERECHNUNG 2-D VISKOSER STROEMUNGEN MIT ABLOESUNG AUF DER BASIS EINER INVERSEN GRENZSCHICHTLOESUNG] c34

Eberhard Elsholz, Georg Dargel, and Thiele Frank (Tech. Univ., Berlin) *In* MBB Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 8 p refs In GERMAN Presented at DGLR Symp. on Stroemungen mit Abloesungen, Stuttgart, 23-24 Nov. 1981 (For primary document see N82-23137 13-99)
Avail: NTIS HC A09/MF A01

Two-dimensional viscous flow on large airfoils in the transonic off-design domain was experimentally investigated. An inverse boundary layer calculation technique consisting of the matching between a direct theoretical potential solution and an inverse boundary layer solution was used, i.e., the semi-inverse matching procedure. As matching relations, the overrelaxation formalism of Carter, a relaxation controlled modification, and the Balleur relation were tried. The iterative solution behavior was compared for laminar and turbulent boundary layers. The modified Carter relation gives superior convergence behavior. At increasing Reynolds numbers, the laminar indendation expands, while for turbulent boundary layers, the tendency towards separation is drastically reduced. Experimental and theoretical results agree well. Author (ESA)

N82-23143# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).

MECHANICAL PROPERTIES OF HOT ISOSTATIC PRESSED POWER METALLURGICAL (P/M-HIP) TITANIUM FOR HELICOPTER COMPONENTS c26

Wolfgang Keinath and Marko Tapavicza *In its* Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 30 p refs Presented at 7th DGLR European Rotorcraft and Powered Lift Aircraft Forum, Garmisch-Partenkirchen, West Germany, 8-11 Sep. 1981 (For primary document see N82-23137 13-99)
(MBB-UD-324-81-OE) Avail: NTIS HC A09/MF A01

The mechanical properties of P/M-HIP titanium were investigated for helicopter components applications. Economy of production and material properties, corresponding at least to those obtained with conventional methods, constituted two conditions for the introduction of this technology. A P/M-HIP manufactured blade fitting fulfills the static and dynamic strength requirements. The values obtained with test samples are the same as those obtained with the corresponding wrought alloy. As a result of the reduction in the extent of machining as well as the weight of starting material, a considerable economic saving can be realized by using PM-HIP components in the aerospace industry.
Author (ESA)

N82-23144# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.

A MODULAR GEOPLATFORM CONCEPT FOR INTELSAT 7 AND OTHER APPLICATIONS **c15**

Dietrich E. Koelle and Wolfgang Kleinau *In its* Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 11 p refs Presented at DGLR Symp. on Nachrichtensatelliten-heute u. Morgen, Munich, 15 Oct. 1981 (For primary document see N82-23137 13-99) (MBB-UR-517-81-OE) Avail: NTIS HC A09/MF A01

A geoplatform design with the special features of modularity and integrated transfer propulsion, optimized for launching by space shuttle, is described. Technical results, regarding the geoplatform and its performance in terms of communication payload and mission lifetime, are presented. The reference system design has a total mass of 14,300 kg, including 10,900 kg transfer propellants mass. The initial mass is 3400 kg, allowing for 400 to 700 kg of communication equipment, depending on power level, eclipse capability requirements (batteries) and mission lifetime. As examples, the platform design is shown with a typical Intelsat 7 payload (including and intersatellite link), a German national services payload (TVBS and 20/30 GHz data service), and a multinational direct TV broadcasting payload. The platform propels itself from low Earth orbit to geosynchronous orbit with a 6 impulse transfer, provided by a 5 kN engine (1100 lbs thrust level). This launching mode, although not being the optimum from the performance standpoint, proves to be the most economic. Author (ESA)

N82-23145# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany). Fluid Dynamics Dept.

OBJECTIVES OF AND APPROACH TO SPACELAB THERMAL SYSTEM TEST PERFORMED WITH THE ENGINEERING MODEL **c16**

Helmut Loeser *In* MBB Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 16p refs Presented at Intersoc. Conf. on Environ. Systems, San Francisco, 13-15 Jul. 1981 (For primary document see N82-23137 13-99) (ASME-Bereich81-ENAS-17) Avail: NTIS HC A09/MF A01

With the engineering model of Spacelab, consisting of the long module and a pallet segment, a thermal system test was performed in order to verify the functions of the system within an environment which is representative of the flight conditions. Thermal interaction with the facility environment was minimized. The majority of the tests were steady state. Special test sensors (mainly thermocouples) were installed. Loop experiment loads were simulated by electrical heaters. All test objectives (thermal control, life support, analysis) were met except verification of heat leaks and condensation avoidance. Data handling and software are explained. Author (ESA)

N82-23146# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).

SLIP CONTROLLED WHEEL SETS FOR HIGH SPEED BOGIES [SCHLUPFGEREGELTE RADSAETZE FUER HOCHGESCHWINDIGKEITSDREHGESTELLE] **c85**

Christian Guenther, Helmut Hassel, and Rolf Leo *In its* Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 5 p In GERMAN Presented at 7th Intern. Radsatz-Kongr., Vienna, 25-29 Oct. 1981 (For primary document see N82-23137 13-99) (MBB-UD-325-81-OE) Avail: NTIS HC A09/MF A01

Slip controlled wheel sets were developed in order to enable higher train speeds than with a rigid axle between the two wheel disks. Enhancing critical speed, improving self damping in the stable domain, reducing wheel profile wear, and taking up higher free transverse accelerations within the sliding limit were considered. Theoretical investigations prove the effectiveness of the design. A prototype high speed (350 km/hr) bogie was built, using fiber reinforced composite materials. Tests confirm the effectiveness of the design. Author (ESA)

N82-23147# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).

CALCULATION AND ANALYSIS OF RECTANGULAR CORRUGATED HORN PATTERNS [BERECHNUNG UND AUSLEGUNG VON RECHTECK-RILLENHORNSTRAHLERN] **c32**

Dietmar Fasold and Helge Pecher *In its* Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 7 p refs In GERMAN (For primary document see N82-23137 13-99) (MBB-UR-518-81-OE) Avail: NTIS HC A09/MF A01

Radiation patterns of rectangular corrugated microwave horn antennas were calculated and analyzed. Horns were constructed. The theoretical basis for calculating patterns of these antennas is outlined. Easily usable design curves are presented, e.g., a nomogram to determine the gain and a diagram to choose the required corrugation depth. Measured radiation patterns were compared with calculated ones. The problems connected with optimization of the voltage standing wave ratio are discussed. Possible applications of these corrugated horns are shown. Author (ESA)

N82-23148# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).

STATUS OF COMPUTER AIDED DESIGN/COMPUTER AIDED MANUFACTURING (CAD/CAM) APPLICATIONS IN THE INDUSTRY [STAND DER CAD/CAM-ANWENDUNGEN IN DER INDUSTRIE] **c31**

Harald Walter and Volkmar Antl *In its* Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 15p In GERMAN Presented at VDMA-Symp. Analaesslich der Ausstellung SYSTEMS, Munich, 19-23 Oct. 1981 (For primary document see N82-23137 13-99) (MBB-Z-4-81-OE) Avail: NTIS HC A09/MF A01

A computer aid design/manufacutring concept which defines, processes and evaluates geometrical data is discussed. Applications in aircraft, automobile, ship, and machine construction and in the electrical, electronics, precision mechanics, and clothing industries are reviewed. Author (ESA)

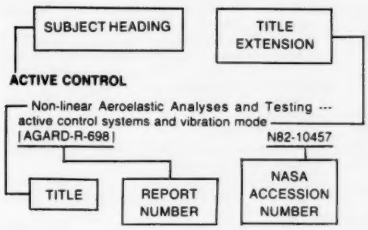
N82-23149# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).

A POINT FOCUSING COLLECTOR FOR AN INTEGRATED WATER/POWER COMPLEX **c44**

Helmut Zewen, Guenther Schmidt, and Safwat Moustafa *In its* Res. and Develop. at MBB. Tech. and Sci. Publ., 1981 1981 17 p refs Presented at 20th Intern. Conf. on Cooperation Mediterraneenne pour l'Energie Solaire, Rabat, Morocco, 23-27 Nov. 1981 (For primary document see N82-23137 13-99) (MBB-UR-579-81-OE) Avail: NTIS HC A09/MF A01

A point focusing parabolic dish was developed in order to deliver process heat and as a solar collector for small solar thermal power stations. The utilization potential of the point focusing parabolic dish was identified and its main design parameters are summarized. The utilization of the collector as primary energy source in a food/water/power complex was tested. In its present configuration, the system is capable of delivering process heat for the temperature range from 150 to 500 C. This point focusing parabolic dish is identified as the most promising solar collector for small solar thermal power stations. Fifty-six dishes were assembled in a 100 kW (electric)/500 kW (thermal) food/water/power complex, which is in operation in the Kuwait desert. The dominating factors for cost reduction are discussed. Author (ESA)

Typical Subject Index Listing



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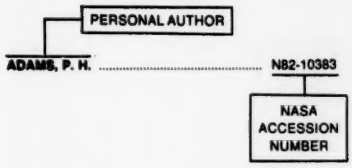

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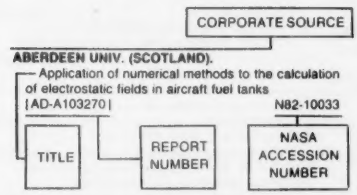

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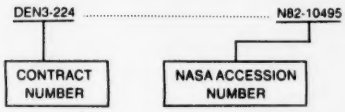

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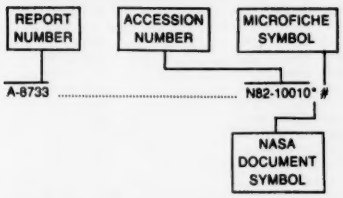

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